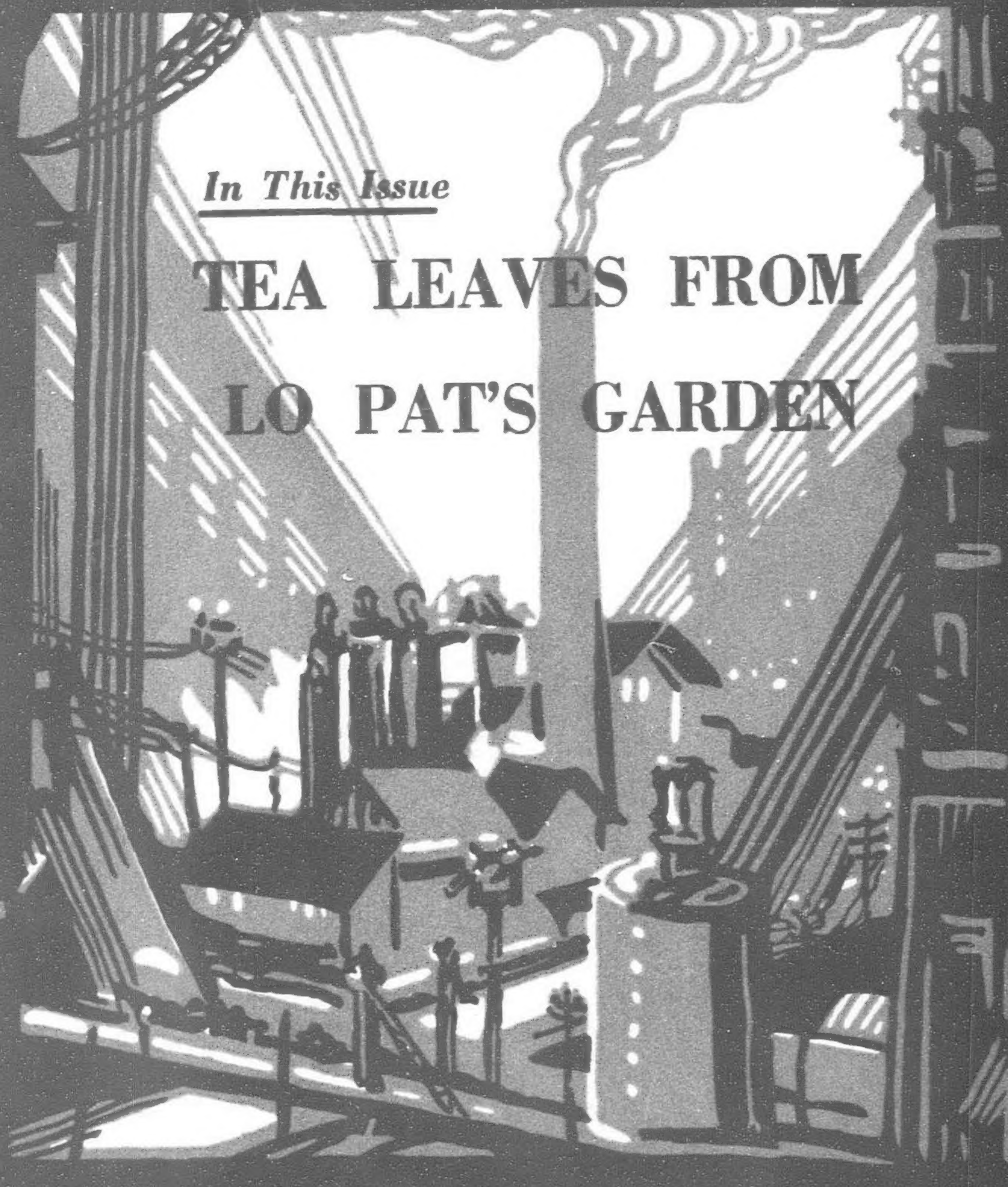


# THE FAR EASTERN REVIEW

FOUNDED BY GEORGE BRONSON REA  
36TH YEAR OF PUBLICATION

*In This Issue*

TEA LEAVES FROM  
LO PAT'S GARDEN



上海黃浦灘  
念四號

遠東  
時報

RED LIGHTS IN EAST ASIA  
—  
ESTRANGED RELATIONS BETWEEN  
JAPAN AND AMERICA  
—  
ENGINEERING STANDARDS IN CHINA

Vol. XXXVI

FEBRUARY, 1940

No. 2





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# The Far Eastern Review

ENGINEERING

FINANCE

COMMERCE

VOL. XXXVI

SHANGHAI, FEBRUARY, 1940

No. 2

## FAR EASTERN CROSS-CURRENTS

IN face of the tense international situation and in view of the necessity of gearing up the national organization of Manchoukuo to a war-time basis, the Government is seeking the voluntary co-operation of all residents in Manchoukuo by carrying out a thorough survey of technical talent in the Empire.

As a result of the survey, the State will be able to mobilize civilian talent on short notice for any venture needed in increasing the efficiency of the State machinery. In this way, Manchoukuo will be able to offer her quota of co-operation to the great task of realizing a new order in East Asia.

The registration of technical skill and talent covers a wide range of minutely specified tasks found in a modern industrial world where specialized labor is playing an important rôle. Nearly two hundred types of work are specified by the Government, covering such diverse talents as aeronautics and foreign languages.

All residents of Manchoukuo between the ages of 14 and 55 are required to participate in the forthcoming census of occupational ability. From this point henceforth, those reaching the age of 14 and falling under the categories listed on the survey chart, must register. Changes in employment, addresses and status are required to be registered by employees in conjunction with employers.

The registration of technical experts and skilled workers is expected to promote the development of Manchoukuo's natural resources, together with the mobilization of various commodities in the country.



THERE are growing signs of opposition toward the State Department's "moral embargo," which is causing a great deal of inconvenience to American industries and manufacturers, as well as exporters.

The *New York Sun*, in a special dispatch from its Washington correspondent, Mr. David Lawrence, said that "although the public may approve the present moral embargo against the Soviet Union and Japan, the real issue behind the moral embargo is causing a great deal of vexation here, in view of the fact that it gives the Government unofficial power to hamper any American businessman who doesn't like the Government's policy generally. . .

"Moreover, the moral embargo may hamper international relations because it gives the State Department or the President exclusive power to cut off commercial relations with foreign countries and lead to the severance of diplomatic relations, which may invite the United States into a war.

"The feeling is prevalent that the question of the moral embargo may become an important issue during the present session of Congress."

General Hugh Johnson, declares in his syndicated column that the moral embargo "which is being applied to so-called aggressors," now includes gasoline processes and others. If such can be done for gasoline, then it means that anything can be done.

"The New Deal Administration boldly is applying the doctrine of 'quarantine aggressor nations' which has been denied by Congress and the people.

"Such a policy indicates that the present Administration wants to involve the United States indirectly in European and Asiatic conflicts, even though the United States has no direct interests there.

"We are setting a record of inconsistency, lawlessness and hypocrisy similar to those laid down by the totalitarian states in the same degree although perhaps in a different category."

THE British Government's intention to have nothing to do with the projected Wang Ching-wei régime in China was voiced in the House of Commons by Prime Minister Neville Chamberlain in the course of the debate on foreign affairs.

In reply to a question, the Prime Minister said that on January 9, the Japanese Government issued a statement to the effect that the movement for a new central government of China was gathering strength and that Japan accordingly would give assistance to the formation of the new Administration.

"The only Government of China recognized by His Majesty's Government, and with which they intend to maintain diplomatic relations, is the National Government of China, of which General Chiang Kai-shek is chairman of the Supreme Defense Council and president of the Executive Council," Mr. Chamberlain declared.



SPEAKING on the Town Hall Meeting radio program in New York on December 14, Mr. William R. Castle, former Under Secretary of State and one-time Ambassador to Japan, stressed the dangers of further friction between America and Japan and urged the Government to take steps immediately to negotiate for the conclusion of a new Japanese-American trade pact.

Failure of the Government to commence these negotiations, Mr. Castle stressed, might lead the Administration to declare a trade embargo, and then Japan "could only believe we want war."

The speaker then advocated that the United States "continue quietly to push liberal principles which always have guided our Far Eastern policy, at the same time avoiding any such war-like action as an embargo."

"What would happen if, in the middle of this European war, we struck Japan with an embargo? The result would turn Japan to Germany and in all probability, to the Soviet Union.

"Also remember that if we embargo trade with Japan, a war is likely to follow. We should win in the end because our resources are much greater. However, it would be a long war, and what would anybody get out of a Japanese-United States war?

"It would be a naval war, fought from necessity on the other side of the Pacific, and we should have to begin by building a fleet large enough to attack Japan in its own waters. That would take years.

"It would be a war of attrition, its aim would be the starvation of the entire people, and what would be the use of such a war when it was all over?

"It would not help China because such a war would mean the closing of China's ports and it would mean leaving that country open to Soviet invasion in the west and north.

"Such a war would mean the immediate annexation of the Philippines by Japan and would paralyze China, Great Britain and France as well as the Dutch possessions in the Far East."

Mr. Castle then declared, "Those who say that the United States, by selling to Japan has enabled Japan to carry on its war in China are talking sheer nonsense.

"Part of the American condemnation of Japan's action in China is based on ignorance, and because 'we are sentimentalists and think China the underdog.'

"The rupture of commercial relations with Japan would cost the United States a vast export market including the loss of the sale of about 1,000,000 bales of American cotton annually which penalize further the already greatly suffering south."



JAPAN'S action in reopening the lower Yangtze River to navigation may mean the materialization of closer relations between Japan, Britain and America, and hence is a matter of deep concern to Germany, political circles in Berlin commented in December.

Opinion seems to be that America's attitude toward the Far East lately has become increasingly strong, since Britain has been compelled to divert its power to Europe, leaving the responsibility of protecting foreign rights in the hands of the United States.

America is believed here to have succeeded in gaining the reopening of the Yangtze by utilizing the invalidation of the American-Japanese commercial accord. Having gained one large concession from Japan, it is feared that Britain and America may take the occasion to make new demands against Japan.

Although admitting that there is a growing tendency toward readjustment of relations between Japan and the Western Democracies, they hold that there is some doubt as to whether Japan will succeed in its present policy of trying to reach an understanding with the Soviet Union, America and Britain at the same time.

Should Japan reach an understanding with America and Britain, Germany would be considerably affected, since the Anglo-American governments would be able then to turn their full attention to Europe.



IN view of the expiration of the Japanese-American Trade Treaty some time this month, and its important bearing on the outcome of the Sino-Japanese war, China is at present mobilizing every effort to win American support.

American residents in China, Chinese public bodies, and Chinese students graduated from American universities, are separately sending appeals to American friends and supporters, urging them to take strong steps to check Japanese aggression in China.

Chinese broadcasting stations are devoting the main part of their program to special broadcasts for America.

Former students of the Tsinghua College, who have studied in American colleges and universities, decided at a meeting to write separately to their former school-mates, professors and friends in the United States urging them to do their utmost to help China.

The Harvard Club, of which Mr. T. V. Soong is president, sent a telegram to Senator Key Pittman, Democrat of Nevada. The message stated:—

"We hope that the present session of Congress will suspend such trade with Japan as may help or prolong the aggression of China. All means short of war, but powerful enough to halt Japanese aggression, should be utilized by America at the present moment. We appeal to you in the name of humanity and civilization."—Reuter.



THE U.S. Senate, on February 13, approved the bill increasing the capital of the Export-Import Bank U.S.\$100,000,000, which will enable the Government to make loans to Finland and China. The Senate voted 49 to 27 in favor of the bill.

The Bill will go to the House of Representatives where it is expected to receive early approval.

The Senate passed the bill expanding the bank's capital after it had rejected 50 to 27 an amendment proposed by Senator Robert A. Taft, Ohio Republican, which would have cut in half the proposed increase.

Opponents to the bill charged that the measure was "opening a wedge for promiscuous loans which might involve the United States in war."

The bill specifically bans military loans to foreign countries. Although Finland and China were not mentioned specifically, Senators repeatedly emphasized that the bank should immediately make a loan to China and Finland.

Senator Robert R. Reynolds, Democrat of North Carolina, the only Senator who attacked the loan on the floor, declared that the bill would aid Bolshevism. The United States, he said, had bought "its share of a future war by lending U.S.\$25,000,000 to China." He added that by buying silver and pig iron from China the U.S. was indirectly aiding Bolshevism.

Other opponents of the bill, although they opposed a loan to Finland because of the fear of becoming involved in the Russo-Finnish war, did not attack the Chinese loan.

As the United States and the Soviet Union are the only two countries in a position to hamper Japanese action in creating a new order in East Asia, and it is next to impossible to reach an agreement with America regarding the Japanese continental program, the conclusion of a non-aggression pact with the Soviets would be of help in the final disposal of the China incident, according to Mr. Toshio Shiratori in an article in the *Hochi*.

Mr. Shiratori, former Ambassador to Italy, who has long been an advocate of closer ties between Japan, Germany and Italy as signatories of the anti-Comintern agreement, was placed on the waiting list of the Foreign Office for his refusal to resign at the request of Foreign Minister Kichisaburo Nomura following the retirement of Lieutenant-General Hiroshi Oshima from the diplomatic service immediately after his return to Japan from Germany on November 11, the *Yomiuri* recalls.



INTENSE diplomatic negotiations in Moscow and Tokyo over the year-end holidays have been rewarded by the last-minute conclusion of a *modus vivendi* extending for another year the temporary Japanese-Soviet fishery agreement assurance of early negotiations for a permanent fishery treaty, and marked progress in the Soviet-Manchoukuo border demarcation conference, according to Domei.

A series of communiques issued by the Foreign Office Information Bureau reveal the whirlwind progress with which knotty problems between the two countries have been solved and by which the ground has been prepared for the removal of other traditional obstacles.

The perennial fishery issue was ironed out satisfactorily by the conclusion of a *modus vivendi* only an hour before the existing agreement was due to expire.

Arrangements have been made for payment to the Soviet Union of the final instalment of the transfer price of the North Manchuria Railway, formerly the Chinese Eastern Railway, which hitherto has been the chief obstacle blocking the conclusion of a permanent fishery treaty between Japan and the Soviet Union.



PREDICTING the eventual disappearance of the régime of Gen. Chiang Kai-shek, Major-Gen. Francis S. Piggott, former Military Attaché to the British Embassy in Tokyo, strongly defended Japan's conception of a new order in East Asia.

Speaking at Chatham House, Major-Gen. Piggott, who recently returned from Japan, noted that the Sino-Japanese conflict was now becoming more of a "side-show" than frontpage news. He then openly predicted that the dispute would end with the disappearance of the régime of Gen. Chiang Kai-shek.

Major-Gen. Piggott cited three factors as the reasons for his belief of an eventual Japanese victory. These were:

- (1) That the Japanese army is now more powerful than ever before;
- (2) That the effects of the war in China were not very noticeable in Japan, the only shortage felt being in cotton, petrol, and coal; and
- (3) That Japanese successes in Formosa, Korea and Manchoukuo made further successes in China likely.

The Japanese idea of a new order in East Asia, Major-Gen. Piggott explained, meant that the Japanese want China to be a better neighbor and that they desired certain political and economic advantages in North China.

The returned officer admitted that the Japanese authorities in the field were inclined to be anti-British but that the high command in Tokyo was "realistic, neutral and ready to be friendly with anyone useful."

Anglo-Japanese relations were at their worst last summer over the Tientsin dispute, but they seemed to be improving rapidly following the partial settlement of the *Asama Maru* case. During the Tientsin crisis, he added, the Japanese people really thought that the British were definitely assisting Gen. Chiang.

Referring to the Japanese character, Major-Gen. Piggott remarked that it had been said that a certain nation yielded nothing to reason but everything to force. As regards to the Japanese, he stated, they yield nothing to force but nearly everything to friendship and affection.

"We must have faith, hope and charity," Major-Gen. Piggott concluded.



REPLYING to a question put by an American correspondent, the Foreign Office spokesman said that if the United States enforced an embargo against Japan as advocated by Senator Key Pittman, Japan would take it as an affront.

A treatyless state between the United States and Japan, the result of allowing the 1911 Treaty of Commerce and Navigation to lapse without the signing of a *modus vivendi*, was regarded by the Japanese people as highly undesirable, the spokesman asserted. Should this be followed by an embargo, such action would naturally be imprinted on the people's mind.

As a result of the expiration of the trade treaty there had been no change in Japan's attitude towards the United States, the spokesman said.

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ADMIRAL Mitsumasa Yonai, the Japanese Premier, on February 10 sounded the second warning in three days that Japan would not tolerate any oppression by the United States and was prepared to take action to prevent such a measure.

The Premier made this statement in the Diet after an interpellator, Mr. Yoshiharu Yutani, had attacked the Foreign Minister, Mr. Hachiro Arita, for his "servile diplomacy" toward America and in handling the *Asama Maru* case. He also attacked the Premier.

"Japan is fully prepared to take appropriate steps in the event the United States continues its oppression," Admiral Yonai told Mr. Yutani when the interpellator also charged him with a weak policy toward America.

Mr. Yutani pressed the Premier for details on his statement, but Admiral Yonai said, "I must act according to developments and I cannot say anything more fully."

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THE *New York Daily News*, in an editorial titled *Isolate Japan*, strongly urges immediate application of an embargo on exports to Japan, declaring that the present as at no other time, affords an excellent opportunity for obstructing the designs of the Japanese military in China.

Japan, the tabloid newspaper says, is at present estranged from other countries and domestically is confronted with such economic difficulties as a shortage of electric power. America alone can now brandish the sword and sweep away the military clique which manipulates the Japanese people from behind the scenes, the paper declares.

Should America fail to utilize its present opportunity, the editorial continues, Japan ultimately will conquer China, and should that period dawn, Japan may make use of the manpower and raw material acquired to endanger Guam and the Philippines.

America, as a first step, should prohibit the export of arms to and apply economic pressure on Japan. Should this fail in impeding Japan, America should then invoke the second step, that of enforcing a general embargo on exports to Japan. "A golden opportunity has presented itself—it is now the time for action," the editorial concludes.

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It is a mistake to believe that Japan will give way before American economic pressure, Mr. Walter Lipmann, *New York Herald-Tribune* political commentator, wrote in a special article analysing the present Far Eastern situation.

If the U.S. were to take such measures, Japan would immediately try to destroy the power of America's possible allies in the Far East, the writer forecast. "Japan would ally herself with those European nations which are engaged to-day with our possible associates in the Orient," he stated. "Japan would not attack us directly but would attack our friends. Her aim would be, while avoiding open war with the United States, to isolate us completely and place us in a position where we would have to accept their attitude or else fight alone in extremely difficult conditions. Japan knows that if the Allies were to be chased out of the Far East and beaten or rendered powerless in Europe, the United States would be incapable, whatever its strength, to enforce respect of its interests in the two oceans at the same time.

"Senator Arthur H. Vandenberg (Republican, Michigan) was right last July when he predicted that the Far Eastern problem could not be solved without the aid of the European powers. He was more right than he believes even now," the well-known commentator said.

ANALYSING Japanese-American relations, the *Herald-Tribune* in an editorial emphasized that the appearance has now developed in Washington that legislative as well as official circles are stressing practical issues, rather than normal ones, as a basis for a settlement of problems existing between the United States and the Japanese Government.

The journal declares that such development is not only attributable to pressure by southern cotton interests, west coast shippers and importers, and eastern silk manufacturers, but to clearer reasoning. That is, "if Japan shows some consideration for American rights and interests in China, then the United States won't at present cut off essential supplies to Japan and would be indifferent to Japanese efforts to create a 'new order' in East Asia \* \* \*

"Moreover, it would be possible to assume that popular, as well as official, interests are so concentrated on the European scene that they haven't time to think about the Far East," the editorial said.

The journal said that it understood officials in Washington now believe that it would be wiser to let the Far East situation alone since Japan is unable to break the deadlock in China and hasn't any immediate prospects of closing the Sino-Japanese conflict or profiting from it. Therefore, it is considered best to let Japan alone now as far as is possible and then reconsider the Far Eastern problem if and when the European situation permits.

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THE U.S. Senate foreign relations committee, when about to begin considering the American-Japanese situation, was urged to "go slow" in dealing with the anti-Japanese embargo proposals by three members of the Upper House, Senator Robert F. Wagner, Democrat of New York; Senator Gerald P. Nye, Republican of North Dakota, and Senator Burton K. Wheeler, Democrat of Montana.

The three senators warned that the committee's deportment in considering the anti-Japanese measures might possibly be interpreted as an affront by Japan.

Senator Key Pittman, chairman of the committee and author of one of the embargo proposals, charged on the other hand that if Congress refuses to give the President discretionary power to invoke an embargo against Japan, this not only would confirm Japan's suspicion that the Senate is afraid to vest even discretionary power in the President, but would encourage Japan to continue discrimination against American citizens in China.

Suggesting a delay of a month or so to study Japanese activities, Senator Wagner declared that it would be "a bit too impetuous" for the committee to take immediate action on the embargo plan.

Senator Nye unalterably opposed placing an embargo on exports to Japan.

Senator Wheeler said he was very hesitant to approve an anti-Japanese embargo because "it could only stir up ill-feeling against the United States."

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THE U.S. House of Representatives, on February 16, passed the record-breaking peacetime naval appropriations bill calling for \$995,772,878 for the construction of dozens of additional warships and the fortification of a dozen strategic naval bases.

The House struck out the proposal to appropriate funds specifically for the development of the harbor at Guam Island, only 1,500 miles south of Yokohama, by the close vote of 213 to 114. No record vote was taken. Supporters of the Guam harbor development item indicated they might call for a record vote later this week.

Most impartial observers believed reports that Tokyo looked with disfavor on the Guam proposal had little influence in the vote. Some even said that defeat of the proposal would have been more decisive if such remarks had not been made.

The House applauded the statement of Mr. Knute Hill, Washington Democrat, that the United States undoubtedly has as much right to fortify Guam as she has to the freedom of the seas, but "it would be folly to do so. The best thing for us to do is stay home."

Some speakers insisted that the funds could be spent more usefully for domestic purposes in relief farm aid.

The Guam item was eliminated from the bill following arguments contending that development of the island for the Navy might increase the danger of America's becoming involved in Far Eastern conflicts.—United Press.



WARNING that any move to impose trade embargoes against Japan would result in international complications, Senator Alexander Wiley, Republican of Wisconsin, declared in the Senate that before talking about assistance to China, America "should consider other proposals Japan might wish to make." He suggested a Japanese-American round-table discussion for the solution of outstanding questions.

Senator Wiley pointed out that three possible dangers should the U.S. attempt to impose embargoes against Japan. He said Japan may declare war against China, blockade all Chinese ports, and exclude all foreigners from Japanese occupied territories in China.



THE question of the abrogation of the Nine Power Pact should be studied to determine whether it would hamper or accelerate the establishment of the "New Order in East Asia," Mr. Hachiro Arita, the Foreign Minister, told a Budget Committee meeting.

Dr. Ichiro Kiyose, member of the Diet, urged the Government to denounce the Nine Power Pact, in view of Soviet Russia's "violation of the pact" by placing Outer Mongolia under her sphere of influence. He also pointed out that if it was considered necessary for the United States to abrogate the Japanese-American trade pact to conform to the "new situation" in the Far East, Japan should also abrogate the Nine Power Pact for the same reason.

Meanwhile, on Thursday, the *Asahi Shimbun* revealed a movement in Japan which advocates the abrogation of the Nine Power Pact if the United States imposes an embargo on the shipment of war materials to Japan.

Mr. Arita, answering Dr. Kiyose's interpellation, said the question of the abrogation of the Nine Power Treaty "requires careful study."



THE expiration of Japan-United States trade treaty will only be the starting point of the United States' solution of Far Eastern problems, Rear-Admiral Harry E. Yarnell, former commander-in-chief of the American Asiatic Fleet and currently sponsor for the American Committee for Non-Participation in Japanese Aggression, told the *New York Herald-Tribune* in an interview.

Admiral Yarnell declared that he would welcome any move to limit American supplies of raw materials for Japan's use against China. However, he added, that alone will not solve everything.

As a suggestion for the solution of Far Eastern problems, he believed that, if the Western Powers really were sincere in solving the difficulties, some international plan to give Japan a sufficient trade outlet in the Pacific should be made.

If Britain, the United States, France and the Netherlands would give up some of their special interests and accord Japan equal trade opportunities in India, Indo-China, the East Indies and in the Philippines, Admiral Yarnell predicted, the situation might be considerably eased.



QUESTIONS pending between the United States and Japan will be listed in an official communique to be issued here soon by the Japanese Foreign Office.

Following an understanding on the subject with the American Government, the Gaimusho, it was understood, would make public various issues that have arisen between the two nations as a result of Japanese military operations in China.

Mr. Hachiro Arita, the Foreign Minister, replying to an interpellation at a meeting of the budgetary committee of the Lower House said such an announcement would be made "at an early opportunity."

Mr. Joseph C. Grew, American Ambassador to Japan, on November 4 last year submitted to Admiral Kichisaburo Nomura, then Foreign Minister, a list of cases of alleged infringements by Japan upon American rights and interests in China.

On December 4, Admiral Nomura handed Mr. Grew an official note listing the cases recognized by the Japanese Government as valid and, therefore, subject to compensation. Several cases have already been settled, the Foreign Office announced.

Citing cases where neutrals had been refused indemnity by the United States Government, for damage sustained following action by the armed forces of the United States, such as in the bombardment of Vera Cruz, Mexico, the Japanese Government was understood in its note to have declined to recognize numerous American claims.

THE Yangtze River will probably be reopened to foreign shipping about March 1, usually reliable Japanese quarters forecast.

Simultaneously, the same sources outlined three other current or near-future developments which are expected to relax United States-Japanese tension.

Firstly, diplomatic conversations will be resumed at Tokyo within two or three weeks, they said, to seek a solution to the controversy between Japan and the U.S. over questions regarding China.

Secondly, progress is expected to be made in the settlement of numerous United States damage complaints in China.

Thirdly, there will be an indefinite delay in Senate consideration of an embargo against Japan.

One Japanese source said that when Japan promised to reopen the Yangtze, she believed that it would take approximately two months.

This may have been slightly optimistic, he said, but the current situation suggests that there is a possibility of reopening the river some time early in March.



TAKAO SAITO, leading member of the Japanese House of Representatives, who bitterly assailed the restrictions of the famous Konoye Statement during a plenary session of the House of Representatives on February 2, will probably be expelled from the Diet.

Although many members of various political parties rallied to support Mr. Saito, and recommendations have been made that his punishment should consist only of a short suspension, the Government and the army have so stiffened their attitude that no other course seems possible.

First reactions of the Government, the army and the political parties in the Lower House were that Mr. Saito should be dismissed. Sentiment in his favor, however, gained strength in the Lower House, it being held that he should not be too severely punished in view of the constitutional right of freedom of speech in the Diet.

But the Government's attitude unexpectedly became strong, so much so that a Cabinet minister asserted the Cabinet should submit suspension of the Diet to the Throne if the House of Representatives should decide to punish Mr. Saito so lightly.

Informed by the Ministers who represent the political parties in the Cabinet that the attitude of the Government and the army was unexpectedly strong, the Kuhara faction of the Seiyukai and the Minseito have concluded that expulsion of Mr. Saito from the Diet is the only solution.



WITH the imminent establishment of a new régime in China under Mr. Wang Ching-wei, opinion is gaining ground in Government quarters in favor of sending Prince Fumimaro Konoe, president of the Privy Council and author of the so-called Konoe statement setting forth the policy of the Japanese Government toward the situation in China, as a representative of Japan at the formal inauguration of the new régime in the capacity either of an ambassador to the new administration or of a special envoy, according to the *Miyako*.

In view of the importance of the inauguration of the new régime and the negotiations for adjustment of relations between Japan and China which will follow the formation of the new régime, it is believed that Japan's representative will be accompanied by representatives of diplomatic, financial, military and political circles.

The *Miyako* says that there are indications that Sino-Japanese peace negotiations will be opened at Shanghai or at Nanking in March or in April, at the latest, following the establishment of the new régime.

The policy of Japan regarding the establishment of the new régime already has been fixed with the approval of the China Affairs Board, it is said. In accordance with this policy, the journal continues, the Government will extend recognition to the new régime, appoint an ambassador and conduct negotiations with the new régime for the restoration of peace between Japan and China.

By way of showing that it will respect fully the autonomy of the new régime and that it intends to deal with China on an equal basis, the Japanese Government will accredit to the new régime an envoy of Ministerial caliber instead of a military commander, Prince Konoe is believed, therefore, to be just the man for the job.



ALTHOUGH the *Asama Maru* incident was regarded as unfortunate, the goodwill shown during the delicate negotiations for its settlement was welcomed in London as an encouraging and hopeful indication for further improvement in Anglo-Japanese relations.

There was an inclination to minimize the significance of the partial surrender of the Germans seized aboard the Japanese liner by a British warship on January 21, but the amicable solution was generally welcomed as a triumph attributable only to prudent and restrained Anglo-Japanese diplomacy.

Officials declared that, although both sides agreed to differ on the legal aspects of the case, still a practical solution was found whereby Great Britain maintains its own interpretation of international law and at the same time avoids disturbing Anglo-Japanese friendship.

Japan, on the other hand, was said to have gained the honor of securing an unchallenged sphere of influence in the Western Pacific.



LINKING Japanese bombings of the Yunnan Railway to the question of landing facilities for Japanese airliners on a proposed Tokyo-Bangkok line in Indo-China, the French authorities have blocked plans for the inauguration of the air line by withholding authorization to the Japan Airways Company to use the Hanoi aerodrome.

Under an agreement concluded on November 30, last year, between the Japanese and the Thai governments, regular aerial traffic was scheduled to open early in February between Tokyo and Bangkok, a Government spokesman declared before a budgetary sub-committee meeting of the Lower House.

A tentative schedule, whereby Japanese airliners would make an overnight stop-over at Hanoi, was prepared, but negotiations with the French authorities on the question ran into difficulties when the French brought up the question of the bombings of the Yunnan Railway.

Discussions were still proceeding with the French authorities, the spokesman stated.



MR. Eugene H. Dooman, Counsellor for the United States, handed the Tokyo Foreign Office a memorandum on February 1 containing "very many legalistic points," it was revealed by Mr. Y. Suma, Foreign Office spokesman, at a press conference. The note is said to concern the interruption of American commerce along the Yunnan railway by Japanese bombing.

The United States deems the railway a main line of communication with Chungking, where are at present many American residents, the communication is reported to have added. Mr. Suma stated that the memorandum needed careful study before a reply could be made.

Japanese forces have no intention of bombing non-combatants, he declared. "We believe our military forces are carrying out their actions with the greatest of care. The Japanese Government fully endorses the action which was taken against the railway."

A recent dispatch from the Japanese Ambassador to France, after an interview with M. Edouard Daladier, the French Prime Minister, showed that France was prepared to give no response to Japanese desire regarding traffic on the Yunnan railway, the spokesman added.



How much longer will the China incident last? How is it hoped to dispose of it? What is meant by a new order in East Asia? These and other questions were addressed to the Government in the House of Representatives by Mr. Takao Saito, Minseito, during an interpellation in which he complained about the secrecy surrounding important national policies and the abstract statements regarding them made by Government leaders.

Premier Yonai apparently told him only that the policy for disposal of the incident is immutable and will be carried out with determination. Foreign Minister Hachiro Arita made no response to Mr. Saito, nor did War Minister Shunroku Hata, who is expected, however, to make a detailed statement in the House answering the questions from the standpoint of the army.

Mr. Saito's questions and comments aroused a storm of indignation among Social Mass Party and Jikyoku Doshikai members of the House, reported the *Nichi Nichi*, which said that War Minister Shunroku Hata announced later that he intended to speak in criticism of Mr. Saito's words.

TAKING action to prevent the recurrence of incident such at the *Asama Maru* case, in which German passengers were removed from the company's liner by a British warship, the San Francisco branch of the N.Y.K. line announced that henceforth tickets will be issued to Germans only on presentation of affidavits attesting that they are not on the active list or returning home for military duty.



WITH the exception of the cook, who is believed to have drowned, all passengers and crew-members have been rescued from the 14,187-ton Philippine liner *President Quezon*, formerly the *President Madison* of the Dollar Lines, which ran into a reef early on January 27, off southern Kyushu, and sank at 11.45 o'clock in the morning after drifting off.

Reports received from Kagoshima, Nagasaki and Osaka are confused as to the number of passengers and seamen carried by the ill-fated liner. A radio message from Nagasaki during the morning claimed that 12 passengers and a crew of 114 were aboard the boat. A later report said there were 480 passengers and 80 crew members, while a third report from one of the rescue vessels said that 14 passengers and 95 members of the crew had been taken off.

Japanese vessels which participated in the rescue work were the *Ukishima Maru* of the Osaka Shosen Kaisha, the first to arrive on the scene, the *Tokiwa Maru* of the Kaburagi Kisen Kaisha, the *Tosei Maru* and the *Kikukawa Maru* of the Kawasaki Kisen Kaisha.



ADMIRAL Mitsumasa Yonai, the Premier, on February 7 warned that the United States would have to understand Japan's aims or be prepared to meet a firm Japanese attitude. He sounded this warning in the Diet after creating a sensation by recognizing Generalissimo Chiang Kai-shek for the first time in making the statement that Japan would be willing to accept Chungking leaders, "even Chiang Kai-shek," as individuals into the proposed Wang Ching-wei régime.

This was the first time that a responsible Japanese statesman said that Japan would have anything to do with Gen. Chiang.

Among other sensational statements, Foreign Minister admitted that it would be difficult to recognize the Wang Ching-wei régime and simultaneously invoke belligerency against Chungking. He also said that Japan was emphasizing to Moscow the importance of the Soviets ceasing their assistance to Chungking.

"If America does not try to understand the true intentions of Japan and attempts more pressure we are prepared to take a firm attitude," Admiral Yonai warned.

Admiral Yonai made his statement regarding Gen. Chiang in reply to an interpellation by Mr. Yoshimichi Kuboi.

Concessions in China "should be conducted in accordance with the spirit of the new order in East Asia" and "if third Powers willfully obstruct Japanese progress in China the Japanese Government will take a determined attitude," the Premier warned.



FIGURES relating to the business of theaters, motion picture houses, cafes, bars and restaurants in Tokyo have shed a lurid light on the sort of lives the people are leading under conditions of the China incident, according to a survey by the *Nichi Nichi*.

The paper found that there were 19 principle motion picture theaters in the city with a total of 26,259 seats. According to the Metropolitan Police Board, a total of 8,522,065 admissions were sold in the past year by theaters and motion picture houses. This means that 300 times as many people visited the 19 principal show houses in Tokyo as there were seats. Of this number, 7,256,995 persons visited theaters and nearly 1,000,000 the motion pictures houses, the balance going to other kinds of shows. The figures amply demonstrate the partiality of Tokyo people for the classical kabuki stage.

The number of people patronizing the motion picture theaters has increased four times since 1929, an increase of more than 2,000,000 annually having been registered in motion picture patronage during the period.

There are about 25,000 "licensed" houses in Tokyo and 3,300 waiting houses, 5,900 geisha establishments, 5,300 cafes and bars, 1,200 restaurants, 3,500 sushi shops and 5,900 soba shops. The number of women employed in the entertainment business in Tokyo is put at 78,228, of whom about 20,000 are cafe and bar girls and 8,000 geisha.



In a subsequent article the same writer asserted that American involvement in the Orient without absolute certainty of the United States' security in the Atlantic would amount to an "unpardonable blunder \* \* \* of advancing into danger without safeguarding our rear," declares Mr. Walter Lippmann, noted commentator on international affairs, in his syndicated column to-day.

"Since the Japanese already know this, Mr. Lippmann said, 'we soon shall find that we have entered upon a new period in which we shall need more competent leadership for our safety and self-respect than that which we are now getting from Washington.'"

The article said that upon the expiration of the American-Japanese trade treaty, the United States crossed the Rubicon which separates diplomacy that relies upon legal argument and diplomacy wherein measures actual or threatened become part of international discussion. The United States has not yet succeeded in realizing the grave situation which has developed against it in the Far East. However, it cannot be argued that the United States has taken up a position difficult to reconcile in consequence of Senator Vandenberg's resolution of July 18, because he proposed, first, abrogation of the commercial treaty between the United States and Japan and, second, collective action to uphold the Nine-Power Treaty.

The dispute between Japan and the United States does not revolve on matters covered by trade but hinges upon the nine-Power treaty. Nevertheless Senator Vandenberg's resolution and the consequent action of the State Department implied that the trade agreement should be abrogated in order to induce the Japanese authorities to renege their commitments under the nine-Power treaty. This step was responsible for Foreign Minister Hachiro Arita's declarations in his Diet speech this week which revealed Japan's uncompromising attitude. Moreover, it is evident that Japan will not permit things to drag out until the end of the European war because it feels that if it did so the Allies then would return to the Far East and side with the United States.

Thus, "we have threatened an act. And, in foreign relations, a threat which fails to be carried into effect may easily prove just as dangerous as one which is carried out."

The problems between Japan and the United States cannot be solved, Mr. Lippmann says, "until men with influence and responsibility like Senator Vandenberg learn to think of American security with a mind that always remembers two oceans."



As the absence of a commercial treaty "is not desirable for either Japan or America," efforts will be made "in the confident hope that Japanese-American relations will be restored to a normal status, that is to say, on a treaty basis," Foreign Minister Hachiro Arita declared in his Diet address on foreign affairs, given first in the House of Peers and then in the House of Representatives. He voiced belief that "with the establishment and development of the new order, America will come to learn the absence of a desire on Japan's part for either exclusion or monopoly in both economic and commercial fields." Relations with the United States received more attention from him than those with any other one nation, not excepting China.

The aim of Japanese foreign policy, said Mr. Arita, is to stabilize East Asia and then "to bring about a peace based upon international justice." Peace is lacking largely because "some nations insist upon trying to maintain the irrational and unjust international *status quo* relative to race, religion, territory, resources, trade, immigration and other matters by adopting exclusionist policies, or by abusing their superior positions." A rare opportunity is afforded mankind at present "for self-examination," and this makes Japan "feel more keenly than ever the importance of the ethical aspect of diplomacy."

As is usual in the Diet address on foreign affairs, the Minister gave separate attention briefly to relations with most of the major Powers:

*Great Britain.*—The Government has done all in its power to have Britain appreciate the reality of the Sino-Japanese situation. It regrets deeply the *Asama Maru* incident and is doing its utmost to arrive at a satisfactory settlement.

*Soviet Union.*—As feeling between the two countries has taken a turn for the better, the Government plans "to seek concrete and practical solutions of the principal questions now pending, and a consequent general adjustment of Soviet-Japanese relations." It

hopes the Soviets will "amend their policy of supporting the anti-Japanese régime in China and collaborate in securing the peace of East Asia as a whole."

*Germany and Italy.*—Japan's relations with the anti-Comintern Powers "have grown increasingly cordial," and they will continue to be cultivated. The "policy of defense against the Comintern remains unaltered."

*China.*—Japan will do everything in its power to assist in the formation and growth of the new central régime under the leadership of Mr. Wang Ching-wei.

The Foreign Minister reiterated that Japan has "absolutely no desire to do away the rights and interests of third Powers in China" and welcomes "foreign investments in China as long as they are of a purely economic character." Present restrictions, made necessary by military operations, "will be modified or removed as soon as local conditions are restored to normal." A point is being made of giving "due considerations to damages suffered by third-power nationals in consequence of our military operations."

Toward the war in Europe, said Mr. Arita, the Government adhere to the policy of non-involvement. However, the war "is destined to bring about drastic changes in the general situation in Europe, regardless of how it may end, and consequently its effects on the settlement of the stabilization of East Asia are likely to be tremendous." The Government is "determined to take appropriate steps to meet any changes in the situation."

The utmost will be done, the Foreign Minister declared, to promote exports and assure supplies of necessary goods. Vigorous protests have been presented to belligerents that have adopted measures "destructive of the freedom of trade and the freedom of the seas," and the Government is "taking other appropriate steps for the protection of our trade rights."



THE policies of the Yonai Cabinet, which the Premier promised shortly after taking office would be made clear in the Diet, have emerged somewhat from the replies of Cabinet members to interpellations on the administrative speeches in the House of Representatives, and from those in the House of Peers, the *Asahi* says in presenting a résumé of the results of the first days of the session.

Regarding disposal of the China incident, these replies have shown that the Yonai Cabinet intends to execute the disposal policy that was adopted by the Konoe Cabinet and adhered to by the Hiranuma and Abe Cabinets. That it will support actively the new central régime in China under Mr. Wang Ching-wei has been confirmed by the Premier's answer to Mr. Takao Saito's controversial interpellation. In replying to Viscount Koki Okochi in the House of Peers, he committed himself to making public at an early date the substance of the peace negotiations with the Wang régime in order to dispel doubts among the people. Disposal of the incident seems to have arrived at a new stage.

Financially, too, the Government will endeavor to aid the new régime in China, the *Asahi* résumé continues, citing Finance Minister Yukio Sakurauchi's response to the interpellation of Mr. Kiroku Oguchi. A new currency system is to be created through the establishment of a new central bank, and the value of the Federal Reserve Bank-notes in North China is to be maintained.

The Government's policy toward the Chiang Kai-shek régime has been revealed in the Premier's expression of hope that it will be absorbed by the central régime.

Finance Minister Sakurauchi's replies have been notable for the caution with which he has avoided a definite commitment with regard to the deflationary policy associated with his party, the Minseito. He has taken over the budget drafted by the Abe Cabinet and announced that there will be no compiling of a working budget in which deflation might be reflected. At the same time, however, he has declared that the Government will try to save as much as possible in expending the budget.

Most disappointing have been both members' questions and the Government's replies concerning diplomatic matters, says the *Asahi*, which believes that inadequate attention has been given to relations with the United States and the Soviet Union, to the dissatisfaction of the public. As he has been Foreign Minister four times, Mr. Arita's policies are well known. They are based on common sense, the newspaper says, and there need be no anxiety about them. Only with regard to the *Asama Maru* case, however, has he replied very fully to interpellations.





The partner who has been  
Successfully cheating  
Makes the biggest howl  
When the other fellow slips.

♦♦♦♦♦

If husband and wife are the best of friends,  
Why should they act like enemies  
When one or the other falls?  
Friends are supposed to be sympathetic.

♦♦♦♦♦

"Where ignorance is bliss  
'Tis folly to be wise"  
Especially where ignorance  
Is of a pack of lies.

♦♦♦♦♦

He who laughs first  
Should make his laugh last.

♦♦♦♦♦

When a man meets a woman  
Who inspires his respect  
He longs to be cast upon  
A desert island with her—  
If she accepts his proposal  
He gets his wish.

♦♦♦♦♦

The test of a man's sex philosophy  
Is his willingness to have it applied  
To his children.

♦♦♦♦♦

'Tis often the mystery of sex  
Which allures youth—quite as much as  
The impulse of ages.

♦♦♦♦♦

If Youth were to know as much about sex  
As Middle-age  
Romance would resemble a chemical formula.

♦♦♦♦♦

Vice can be defeated only by one  
Who tastes its sweetness and  
Swallows its bitterness.

♦♦♦♦♦

Some men carry such an aura of goodness about them  
That the world  
Resents their indulgence in the most innocent vice—

♦♦♦♦♦

Some men are considered virtuous  
If they abstain from vice  
For even a short time, while  
Others have but to slip once  
To be damned forever.

The fatal temptation  
To a husband or wife  
Would not amount to even  
A passing fancy  
If matings were made by Heaven.

♦♦♦♦♦



Disillusionment  
Is responsible for  
More of the sidestepping in marriage  
Than immorality.

♦♦♦♦♦

The girl who spends most of her time on dress  
Does not have to take  
All of her experience from books.

♦♦♦♦♦

The uglier the girl the more certain she is  
That the man who asked her  
To direct him on the street—  
Had evil intentions.

♦♦♦♦♦

To try to pattern the life of a great man  
By marrying him to Mediocrity  
Is like trying to smother the crater of a  
volcano  
With a blanket of conventions.

♦♦♦♦♦



The size of an object  
Is of little importance—  
It is the importance of it that counts.

♦♦♦♦♦

The mediocre think a great idea a marvel—  
The great think only of its application  
And its effect.

♦♦♦♦♦

It takes a big mind to recognize greatness  
In small things.

♦♦♦♦♦

Our distrust of our kind  
Is an acknowledgment of our own weakness.

♦♦♦♦♦

Women will never enjoy equality until  
They secure the passage of a law  
Requiring the joint signatures  
Of husband and wife  
To all checks, club chits and supper  
reservations.





# Red Lights in East Asia

By C. J. LAVAL

**W**HAT the future holds for East Asia depends almost wholly upon the course American diplomacy will take in this part of the world. It is quite profitless at this late day to dwell upon causes of the conflict in China, to pronounce judgments, and attempt to punish an aggressor or to give aid to one adversary deemed to be a victim of attack. Perhaps the most zealous partisan will admit that every conflict must have two sides, and this is true of the hostilities in China. China's warfare is a very real calamity; it has disrupted every normal activity in all of East Asia, bringing a tragic and mounting total of loss and suffering, not only for the soldiers in areas where fighting is taking place, but for whole vast populations bowed down under adversities that have grown out of paralysed commerce, dislocated currencies and ever-increasing costs of every kind. Almost every morning through the cold months of the winter the Shanghai authorities have had to carry away not less than a hundred dead bodies found in the roadways and alleys of the city, wretches who perished miserably from starvation or from exposure. This is no time to think about parties or governments; it is a time to think about peoples brought to the verge of despair by no act or wish of their own, but by events thrust upon them like some great natural catastrophe.

The soldiers in the field and every element of the peoples on both sides of the conflict pray and hope that it may soon be brought to an end. In the swirl of many conflicting views this is the one common desire. The tragic thing about it all is that realization of this common desire depends in large measure upon external factors.

The régime at Chungking that is recognized by the great powers as the Government of China is probably powerless to make any move to end the war. The conflict between Japan and China began when this Government allied itself with the Communists, who take their orders from Moscow, and it is not to be believed that this Chinese Government now can take action to end the conflict without the assent of its allies.

## When Stalin Said, "No"

Chinese leaders who were high in the councils of the Chinese Government through the first year of the hostilities relate that when the initial move toward peace was made by the German Ambassador to China, Dr. O. Trautmann, at Hankow, the proposal he made to open peace negotiations with Japan was favorably received by all the important heads of the Government. That was in the summer of 1938 before Nanking had fallen. These leaders disclose that the terms to open the peace negotiations were telegraphed to Moscow. The proposal of the German Ambassador received the "veto" of Josef Stalin and thus the opportunity to end the war in the early months of the conflict was stifled. It was the policy of the Russian dictator to weaken Russia's traditional foe by causing Japan to fight a war in China. It is the present-day policy of the dictator, and for the same ends, to force the continuation of the China war, presumably until both China and Japan are utterly prostrate when every Russian aim in East Asia easily may be attained. It is not to be believed that Stalin's viewpoint in 1938 has been modified since in any degree, and it is probable that he could only be brought to change his mind through some form of rapprochement with Japan that would give promise of greater advantages than he has seen in the situation up to this time—such as the opportunity to bring about a war between Japan and the United States. By reason of the alliance with the Communists the Chungking Government can be little more than a pawn in the working out of the present-day situation.

"The Peace Movement" in China, which has developed and gathered strength through the past year, originally grew out of the situation at Chungking when it was seen that the Russian influence there was gaining ascendancy. The terms upon which Japan stood ready to end the China war that were enunciated at Tokyo in December, 1938, by Prince Konoye, when he was Premier,

furnished the inspiration to Wang Ching-wei, when he was second in command of the Chinese Government, to break away from Chungking and all of the Russian influences there. Escaping various attempts that were made to assassinate him and surviving the broadsides of denunciation and abuse that were directed against him from Chungking, Mr. Wang persevered in his effort to win peace for his countrymen, and an important step in this direction is to be taken in coming weeks when a new Government in China to function in the Japanese occupied areas is to be formed under the leadership of Wang Ching-wei. Chungking and all the supporters of the Chungking régime continue to denounce Wang Ching-wei and his followers as traitors, and every effort is being made to thwart the aim of this Chinese group. The fact remains, however, that the only chance that the oppressed Chinese people have to see an end brought to the Sino-Japanese conflict lies in the course that Wang Ching-wei and his followers have taken.

## Agreements Already Concluded

It may be accepted that the terms of the peace that the new Wang Ching-wei Government will make with Japan to end the war have already been drafted and accepted by both sides, for the negotiations over them have been tedious and long-drawn-out. In this connection, it may be observed that if Wang Ching-wei merely had been seeking self-advancement or gain and was content to be head of a mere so-called "puppet" government under domination of Japan he could readily have achieved such ends many months ago. The terms upon which this peace will be concluded may not be regarded as harsh. In keeping with the pronouncement of Prince Konoye, Japan will receive neither territory nor indemnity, but will agree on a basis of full equality to recognize the sovereignty and integrity of China. The peace treaty will be directed openly against the spread of Communist influence in East Asia, and it will stress the idea of co-operation between Japan and China for mutual advantages.

It goes without saying that the Wang Ching-wei government will enter upon its strenuous career without the blessing of recognition from the great Powers of the Occident. It is unlikely that any of the European Powers will make any move to impede the progress of the new Government. This is the more certain because the European Powers are much too preoccupied in their own spheres to be able to direct any energies in East Asia. The course that events will take in East Asia in all probability will be decided at Washington.

If the American Government remains entirely passive, the new Government of China will have a fair chance to take the first steps to achieve peace and to restore some semblance of order in the land. If some small measure of American co-operation might be vouchsafed to the new Chinese Government, and to Japan, the efforts to end conflict and to restore order in China would be greatly stimulated and quickened.

If the day-to-day status of trade relations between Japan and the United States should be seriously disturbed as the result of action by the American Government, it is fairly certain that a reaction quickly would be felt in China, doubtless greatly to the detriment of the new Chinese Government and of the people of China as well. Imposition of any comprehensive embargo against Japan by the United States would be a grave blow to Dai Nippon and would have results that are not now predictable. Such an eventuality would help neither the Chinese nor American business interests in China, and if the United States were brought to the length of going to war with Japan, American interests in China along with the American trade in the Far East would be wiped out overnight. This would mark the fulfilment of every Russian hope, and whatever might be the end of such a war between Japan and the United States, when it was over America could look across the Pacific and see sprawled all over East Asia the Communist colossus which has proved to be not content with possession of only a sixth of the earth's surface. It would then indeed be time for a renewal on a



grander scale than ever experienced before for thorough-going American rearmament.

### Consequences of War in the Pacific

War in the Pacific between Japan and the United States would not be any brief triumphant naval adventure for the United States, as many American patriots profess to believe. Such a conflict never would be fought along conventional lines of naval warfare in which the opposing fleets would meet and fight it out. An actual clash between the two fleets would be most difficult to bring about; in all likelihood it would be found to be impossible. The great British naval expert, Hector Bywater, declared some time ago that it would require the combined strength of both the British and American fleets to attempt with any hope of success to conquer Japan in her home waters.

In the long chain of islands under the Japanese flag that extend southward from Japan proper to the Philippines the widest channel of approach to the Asiatic mainland and into what definitely are Japanese waters, is the Formosa Channel—about a hundred and fifty miles wide. An invading fleet that at length successfully had blasted a way through the barrier chain of islands into Japanese waters then would be confronted with the problem of blasting a way out again and back into the Pacific, a condition that would require the utter and complete demolition of the whole Japanese Navy. In launching any such onslaught the American fleet would have to carry out the operation four thousand miles from its nearest base and six thousand miles from the American mainland. Undoubtedly the Americans would have to make use of the Singapore Base and the facilities of the newly established French naval bases on the coast of Indo-China, privileges that most cordially and promptly would be accorded. The meaning ultimately of all this should be abundantly clear.

The only completely certain outcome of such a war in the Pacific would be American involvement in the European war with the flames of strife rising in both the Atlantic and the Pacific in a world-wide conflagration. From the beginning of any conflict in the Pacific, seaborne commerce in that part of the world would vanish and American and European interests in China would find themselves in a rather awkward position.

These appear to be clear possibilities of the present-day situation in the Far East. Those Americans that place all reliance on the thought that only "an act of Congress" can thrust the United States into war may find their confidence rudely shattered as time marches on. Events originating thousands of miles away from American territory may suddenly make such an act of the American Congress compulsory. When conditions give them no alternative and force them to play, the Japanese are most nonchalant gamblers with death. This trait is not a thing of volition, not inborn in the Japanese; from the time of their emergence from seclusion—the span of a single human life-time—conditions that have surrounded them have compelled the Japanese to live dangerously. Every mother in all Japan, with pious single-minded purpose, raises her boy to be a soldier, and in this world as it spins to-day, a good soldier, in any language, outranks the loveliest jitterbug that ever used a lip-stick. It was a true appraisal of Japanese character that a British diplomatic official gave recently on his return to England from the Far East when he said these Islanders "yield nothing to force, but yield everything to sympathetic understanding and to friendly approaches."

### The Motive Behind Japan's Acts

Japanese policy from the beginning has been fairly consistent and Japanese actions on the Asiatic mainland have all sprung from the same motive—security against Russia. Whether or not her viewpoint had valid basis, in the beginning of the century, she believed that if she did not annex and control Korea, that territory would be seized by Russia and the menace of the Bear would be brought to her doorstep. A quarter of a century later when the Communist régime at Moscow had made an impressive beginning with the creation of the present-day huge military machine in Siberia, Japan found herself facing bitter animosity of the Chinese Government whose well-organized plans were concentrated upon an effort to extinguish the Japanese economic gains in Manchuria that had been won in the war with Russia. The Chinese sought to expel the Japanese from the country and the Manchurian incident

late in 1931 ensued. After the formation of the National Chinese Government in 1928 the Chinese devoted all of their energies and a great portion of their resources to a program of rearmament and the organization of a vast army. Late in 1936 when Chiang Kai-shek was kidnapped at Sianfu the Chinese Commander-in-Chief was compelled by his communist captors, probably to save his life, to ally his armies with the Chinese Communist forces that had established themselves in China under sponsorship of the Communist Comintern at Moscow. The avowed purpose of this alliance was to make war on Japan.

Japan's position *vis-à-vis* Russia through all these years parallels in many ways the position of the American Government at the time it saw great dangers in the creation in the Western hemisphere of new governments imported from Europe, governments with administrative systems that differed from and were inimical to the American form of government. Out of this situation the Monroe Doctrine came into being. Much in the same way, in the eastern hemisphere Japan has been confronted by the likelihood of an invasion into East Asia of a system of government differing from and inimical to the Japanese system of government. The Japanese sought vainly to adjust differences with the Chinese, but all these efforts were defeated by the Chinese-Communist alliance. The Japanese believed their Empire was menaced, and they believed that once again they had to stake everything in a new struggle for their actual existence. It is possible, assuredly, that the Japanese were all wrong about any menace from Russia, and that their dread in this respect was based on a myth, as has been so glibly urged by some publicists. Recent events, however, in Poland and in Finland, seem to throw a white light upon the quality of Russian benevolence when the Muscovite goes marching. The reality of this conflict in China is that it is another Russo-Japanese war, not a war between China and Japan. Some basis for this view is to be found in the nature of the peace terms Japan has offered to China which leaders of the Peace movement have accepted.

### Reactions in Japan

The nature of popular feeling in Japan to-day following American abrogation of the trade treaty on January 26, clearly reflects a belief that the United States has inflicted an undeserved injustice on Dai Nippon. Americans, in general, undoubtedly will take the position that any sentiment of this kind is unjustified. Whichever viewpoint may be correct has no special bearing on the situation; the writer is striving to deal with plain realities. The feeling exists, and it has given rise to a smouldering resentment in which grave dangers are inherent. "We shall not soon forget," said a writer in the *Japan Times* recently, "this wrong done by the United States to Japan in her hour of trouble."

The professional Japanese haters in the United States, and all the clamorous crew serving alien special interests in the States, will read into this Japanese sentiment a threat and these may be expected to raise anew loud cries for punitive action at Washington. It is not in the nature of the Japanese to remain prayerfully quiescent when facing uncertainties. And what, may be asked, could Japan do? In terse Americanese the answer comes pat—Plenty! It is no secret that through the past six months the Tokyo Government has been preparing energetically to counteract the blow that has fallen and all that ultimately it may imply. Action Washington can take may obstruct the flow of essential raw materials into Japan, and another twist may be given to screw down pressure upon the already sorely restricted Japanese resources. Definitely, however, the imposition by the United States of any general embargo on Japanese trade would not have any decisive effect advantageous to the United States upon the situation in China; such action might wreak destructive harm to Americans and American interests in China, and new hardships quite certainly would be inflicted upon the people of China.

How America's own interests might be affected and possible consequences of an embargo on Japanese trade were set forth categorically recently by an American statesman whose experience entitles him to talk about Far Eastern affairs with all authority. In an address at Baltimore on February 20, Mr. W. R. Castle, Under Secretary of State in the Hoover administration, and a former American Ambassador at Tokyo, declared that application of an embargo against Japan would be an insult to a friendly nation and would not hinder the Japanese invasion of China. He added

(Continued on page 54)



# Estranged Relations Between Japan and America

By SATORU HASEGAWA

(Contemporary Japan)

**F**OR the first time in 29 years, the two greatest and most progressive Powers on either side of the Pacific are without formal treaty relations.

On January 26, a chill and uninspiring day, the six-months American notice of termination became absolute, and at midnight the 1911 Treaty of Commerce and Navigation between the Empire of Japan and the United States of America passed out of existence. It was a grey day in history, although the sun shone brightly in Tokyo and Washington.

All through the decade that has just closed so unhappily, since the Manchurian Incident of 1931, relations between Japan and America had been just a trifle short of cordial. Dating from the inception of the China Affair on July 7, 1937, this cherished association of 80 years' standing had become gradually but progressively strained, with all too few easements, culminating in the American State Department's abrupt action last July 26 in serving notice of its desire to terminate the trade treaty. Unfortunately, relations between these two great Powers whose past associations have been so warm, exemplary and mutually beneficial, are now at the most delicate and unsatisfactory stage of their 80-year history. Worse, there seems to be no break in the dark clouds as this article goes to press.

The painful fact is evident that there are no potential circumstances in sight which might permit the conclusion of a new commercial treaty or even a provisional agreement to govern the extensive trade exchanges between the two countries.

To complete the catalogue of evils, a sheaf of bills and resolutions seeking the imposition of an export embargo against Japan have been submitted to the United States Congress, where they now are awaiting legislative action. Moreover, a gigantic naval expansion program is pending in Congress. This certainly cannot be regarded with equanimity by Japan. Everything considered, there is slight hope that the American attitude toward Japan will take a constructive or co-operative turn, either in regard to the commercial treaty question or relations in general. This is a matter of deep and serious concern for the future relations of Japan and America and peace in the Pacific.

## A Period of Uncertainty

It is true that intensive diplomatic efforts were made in both Washington and Tokyo to avert the adverse effects of a treatyless situation. Envoys with bulging brief-cases darted back and forth between the embassies, the State Department and the Foreign Office. Speeches were made and articles written on both sides of the Pacific by staunch supporters of American-Japanese friendship, aggrieved at the drift of affairs. These efforts were not without their good results, although hope of saving the treaty or effecting a satisfactory *modus vivendi* perforce were abandoned several weeks before the actual lapse of the 1911 agreement.

Late in December, appropriately at Christmas time, the United States Treasury and Commerce Departments made favorable gestures toward Japan, assuring that imposition of the ten per cent discriminatory tariff on Japanese imports would be withheld indefinitely after expiration of the treaty. These governmental departments likewise waived application of increased tonnage dues and lighthouse fees. Moreover, Senator Key Pittman, of Nevada, announced in the Senate floor on the 20th of January, that the status of Japanese treaty merchants and residents in America would remain unaltered.

These gestures were appreciated and reciprocated by the Japanese Government, which announced a few days before the formal expiry of the treaty that it would continue to accord most-favored-nation treatment to American goods and shipping.

These bilateral stop-gap measures will have the effect of preserving virtually intact all benefits of the non-existent treaty, wherefore it may be presumed that there will be no disruption of the normal trade currents between the two nations. On the

surface, then, it would appear that Japanese-American commercial relations will not be affected seriously by the treaty abrogation. United States officials have taken occasion to cite precedents in which American trade with Russia and other countries in the past has been carried forth satisfactorily in the absence of formal treaty relations. Expressions also have been made on both sides to the effect that it would be senseless to permit commercial friction and trade disruption to arise while exploratory steps toward the negotiation of a new treaty are being made.

On the other hand, the situation does not permit undue optimism. It is inevitable that the mere absence of treaty relation will have an intangible adverse effect on commercial transactions, causing uncertainty, anxiety and irritation. For the fact is inescapable that the existing patchwork is highly transitory, being little more than a day-to-day proposition. Both sides are well aware that the flimsy structure may be brought to collapse at any moment without a word of formal notification. The slender and impermanent strands which bind Japanese-American relations may snap under the slightest pressure of circumstances. There is no need to dwell on the fact that this is a highly undesirable state of affairs, and that the uncertainty must be eliminated without delay if mutual relations are to improve.

## Motives Behind the Action

There has been much discussion as to the motives of the United States in abrogating its commercial treaty with Japan. They never have been explained in full clarity, and to some the reasons prompting the State Department to take the step remain obscure. In serving notice that it was the desire of the United States to terminate the treaty, Secretary of State Cordell Hull explained that many points and provisions in the 29-year-old agreement had become obsolete, wherefore the whole trade structure required revamping and renovating. He also declared, as did President Roosevelt, that political considerations played no part in the decision to cancel the agreement.

Despite the manifold explanations, it may be presumed that the United States was prompted to resort to such a step because, in its estimation and interpretation of that pact, Japan had violated principles of the Nine-Power Treaty in connection with its aims and actions in China. By denouncing the commercial treaty, America in effect has bade Japan meditate on its actions and give reconsideration to its future course. If this, indeed, is the case, there will be no hope of solving the treaty question until the present confrontation ceases to exist.

The friction between America and Japan over the China Affair and the Nine-Power Treaty has arisen due to their totally different conceptions of the situation in East Asia, basic questions in regard thereto and the manner of coping with them. As for the unfortunate China Affair itself, it scarcely needs reiteration here that the hostilities started as the direct result of the constant provocation of the Chiang Kai-shek Government and the Chinese Communist Party. Japan endured the intolerable situation until its national destiny, and that of East Asia, were at stake. It eventually was forced to take punitive measures to cope with the anti-Japanese menace on the Continent, resulting in the large-scale war of chastisement that has raged across the length and breadth of China for two and a half years. Call it what you may, an incident or an affair, no one will deny that an elaborate, full-dress war is under way in China. Its sole purpose, and the one to which Japan is devoting its heart and soul, is to bring about a new order in East Asia, free forever from the destructive influence of Communism.

The new China envisaged is one which will dwell in co-prosperity and spiritual accord with Japan and Manchoukuo in the East Asiatic family of nations. Necessary to the realization of this ideal is the eradication of the Red evil, through the erection of joint barriers against Communism, and the perfection of a system



of mutual economic co-operation. These aims are clarified in the Konoye Declaration of December, 1938. Japan asks nothing more.

When China is ready to co-operate in the achievement of these objectives, there will be no further need for prosecuting the costly hostilities. In this connection, there is ample evidence that the Chiang régime, stubborn though it is, gradually is losing its power of resistance. Pressed on every side by the Japanese fighting forces and deprived of the assistance of third Powers as a consequence of the European War, the Chungking Government faces inevitable collapse. At the same time, the Chinese people are rallying in support of the peace and national salvation movement of Mr. Wang Ching-wei. A powerful new central government for China, under the leadership of Mr. Wang, will be an actuality before many days. Suffice it to say that this new administration, under the guidance of one of the most capable leaders in modern China, will be a potent force for bringing order out of chaos and laying a firm foundation for construction of the new East Asiatic order. The Japanese Government, in full sympathy with the lofty and unselfish aims of Mr. Wang, has pledged its support and co-operation, as have the leaders of the Nanking Renovation Government, the Provisional Government of the Chinese Republic at Peking, and the Federated Autonomous Government of Inner Mongolia.

The unreasonableness and injustice of the Nine-Power Treaty, the prime objective of which is to perpetuate the semi-colonial status of China as it existed prior to the outbreak of the current hostilities, is too apparent to require clarification. Suffice it to say that the reply of the Japanese Government (on November 18, 1938), to the American protest of October 6 (of the same year) apropos the Nine-Power Treaty pointed out that "application of an unaltered conception or principle based on conditions existing prior to the outbreak of the present hostilities scarcely can bring about the solution of present-day problems, nor could it be expected to contribute to the establishment of enduring peace in East Asia."

### Treaties and Practicalities

There exists a popular illusion among certain sections of idealistic opinion in America that the American conception of justice and humanity is sufficiently strong to bring peace to the strife-ridden world.

This concept of international morality is based on the respect of treaties and international obligations. There is no disputing the fact that respect for treaties is a strong factor in the preservation of world peace and security, and we are well aware of the fact without being reminded of it by America. There is such a thing, however, as obsolescence in international treaties. When treaty provisions become inapplicable to changed conditions, they should be altered to meet existing conditions. Indeed, this was the reason set forth by Mr. Cordell Hull when serving notice of abrogation of the 1911 Treaty of Commerce and Navigation.

We believe the validity of this argument also applies to the Nine-Power Treaty. History proves that the arbitrary application of obsolete treaties impairs international relations.

And now, regarding the Nine-Power Treaty, we beg to inquire: How can this treaty, which was signed in good faith at a time when China was free from communistic influences and was not antagonistic toward Japan, be applied to the latter-day China, which is shot through with communistic evils and has been increasingly hostile toward Japan in recent years? Our answer is that it is impossible.

In the interests of justice and humanity about which we have been hearing so much, there should be no objection to the proper revision of the so-called rights and interests of third Powers in China which have kept China in a quasi-colonial status for so long. The projected new order in East Asia is based on the independence and autonomy of the Chinese people.

It is deplorable that this anachronistic treaty, which ignores present-day realities, should be the source of friction between America and Japan. All that we can hope is that America will endeavor to seek full enlightenment on the present Far Eastern situation before it attempts to make its narrow legalistic views anent the treaty prevail.

If one is to peer closely behind the altruistic exterior of America's defense of the Nine-Power Treaty, one is like as not to discern selfish motives. In America's forthright insistence on respect of the treaty, from the broad standpoint of international morals, there can be little doubt that it is primarily interested in

the continued respect of its own rights and interests in China. Its rights and interests there are considerably smaller than those of both Japan and Britain, and are concerned more with cultural enterprises than with political and economic affairs.

The fact remains that there is no intention of eliminating the duly acquired rights and interests of third Powers in connection with the establishment of the new order in East Asia. America has not been patient enough to make a thorough study of the objectives of the new order or gain enlightenment thereon. We shall endeavor to explain the substance of the proposed new order directly, but first we shall explain Japan's position in the Far East.

The internal situation in China has undergone a signal change since the Chinese Communist Party was organized in 1920 under the active leadership of the Communist International, exposing all East Asia to the Red menace. Although America, Britain and other Western Powers were inclined to look upon this scourge with indifference, it was impossible for Japan, as the stabilizing force in East Asia, to regard the deplorable situation in China with equanimity. Conscious of its mission as the prop and mainstay of that country, Japan did all in its power to prevent the spread of the evil Red influence. When the Communist policy turned to active anti-Japanism, the Island Empire eventually was forced to take up arms in self-defence and for the salvation of East Asia.

Japan's special position in relation to China, geographically and politically, may be understood more readily if compared to the special relation between the United States and the Caribbean area. This special position of Japan was recognized in the past by both Great Britain and the United States, by virtue of the Anglo-Japanese Alliance and the Ishii-Lansing Convention, both of which were nullified eventually for unilateral reasons by the other parties thereto. Although these international commitments no longer exist, the premise on which they were based remains as an indisputable fact. It cannot be denied that Japan to-day is the only stabilizing force in East Asia, and is the only Power capable of maintaining peace in that vast, teeming quarter of the globe. The conception of the construction of a new order in East Asia is based on this fact, and no problem in East Asia can be understood accurately without recognizing this premise.

### Japan's Purposes

The proposed new order in East Asia stands on the principles of good-neighborliness, joint defence against Communism and mutual economic co-operation among Japan, Manchoukuo and China. Each of the three countries is to maintain its full prestige as an independent nation, and all are to combine at the same time as a single unit to promote mutually beneficial economic development and combat the mutually malevolent Red influence. The principle is to be one of live and let live, and the ultimate goal is lasting peace and prosperity for all.

By promoting close economic co-operation, it must be pointed out unmistakably that there is no intention of creating a system of closed economy or a monopolistic bloc favorable to Japan, to the exclusion of other Powers.

The legitimate rights and interests of third Powers in China will be respected the same as in the past, and there will be no interference with their economic and cultural activities.

Although the progress of hostilities has given rise to unavoidable wartime restrictions, these will be removed the moment the China Affair is brought to termination.

There is one important fact that must be kept in mind, however, and that is that the new China which takes its place in the East Asia comity of nations will not be the foreign dominated semi-colonial grab bag of the old days. It will be an independent China, of and for the Chinese people. It is only natural, therefore, that the international relations of the new China must be different in various ways from those of the old China.

First of all, the independence and the vital interests of the Chinese people must be respected. This means that such third-Power rights and interests as leased territory, extraterritorial jurisdiction and unequal treaties must be revised to conform to Chinese independence. The autonomous tariff right also must be restored to China. Moreover, all political, economic and military measures must take into consideration the best interests of China as an independent nation, as well as the co-operative functions of the proposed East Asiatic economic federation.



As the nuclear leader of the tripartite Asiatic bloc, Japan must be in a position to fulfil its mission and discharge its responsibilities. As has been mentioned before, its most important mission is to strengthen the defences of Japan and Manchoukuo, exterminate Communism and guide the economic development of the three countries.

Being endowed with few natural resources, wherefore it has come to be classified among the "have-not" Powers, Japan has been obliged to import the major part of its defensive and economic materials from Europe and America; Manchoukuo and China, on the other hand, are rich in important raw materials. Since these resources have been developed only to an infinitesimal extent, however, they also have been forced to turn to the Western Powers for materials.

Under existing circumstances, a country without natural resources or with undeveloped wealth faces insecurity in its national existence. It is quite reasonable, therefore, that these three East Asiatic countries should endeavor to improve their lot within their own capacity of strength and ability. A policy of self-sufficiency is only natural.

It likewise is only natural that China should rid itself of foreign shackles when it attains full independence under the new order, in the matter of exploiting its own resources. In other words, China's own requirements for defence and national livelihood must take precedence over the so-called rights and interests of other Powers. Resources over and above those required for its own existence and for mutually advantageous exchange among its East Asiatic neighbors will be open to the development of the other Powers. Likewise, the activities of the latter in investment and commodity markets will be allowed to go on as usual.

Such being the case, the question of foreign rights and interests in China should be readily soluble, in so far as they do not encroach on the nation's independent status.

### Future Possibilities

Returning to the subject of American-Japanese relations, and bearing in mind the above outline of the actualities, it can be seen that America's abrogation of the 1911 Treaty of Commerce and Navigation is closely related to the question of America's rights and interests in China, and that Japan's attitude thus far has been unsatisfactory to the United States. If their respective views remain irreconcilable, and if there is no hope of restoring cordial relations without the acceptance by Japan of America's views anent the Nine-Power Treaty, it will only mean that America is attempting to force unjust and inapplicable principles upon the countries of East Asia, which are striving so hard to take their place among the progressive and proud nations of the world. If things come to such a pass, greater friction will be created, and all efforts to improve mutual relations will go by the board.

However, if America gains a true understanding of the case, possibly when wartime restrictions are removed (as in the case of Japan's recent declaration regarding the reopening of the Yangtze River to free navigation) there is a likelihood that the narrow legal aspects of the Nine-Power Treaty will be overlooked and that the strain will be removed from American-Japanese relations.

If this understanding should come about, and if America eventually understands the true significance of the new order in East Asia and co-operates in its establishment, the China Affair will come to an earlier end and peace and stability will come the quicker. In such an event, the commercial treaty question will be solved immediately and without difficulty.

### Red Lights in East Asia

(Continued from page 51)

that it would be "impertinent" for the United States to assume the rôle of world policeman and said there was strong possibility that assumption of that rôle might end in disaster. Continuing and listing possible consequences of an American embargo against Japan he said.

Firstly, it might lead to a formal declaration of war against China by Japan, thereby making the blockade against China legal.

Secondly, it might lead to a Japanese alliance with Germany and Russia.

Thirdly, it might lead to a Japanese alliance with Germany with subsequent Japanese naval action against Great Britain in the Orient.

Fourthly, it might precipitate retaliatory action by the Japanese military against American lives and property, both in China and Japan.

Fifthly, it might bring serious economic penalties in the United States through the loss of a customer who bought U.S.\$240,000,000 worth of American goods in 1938.

"An embargo is a step towards war," Mr. Castle declared and, concluding his address added, "I do not mean to say that Japan would retaliate by declaring war against the United States, but nevertheless I believe that the same kind of crazed young officers who attacked the *Panay* might sink an American ship in retaliation or destroy American lives in Japan.

"What in heaven's name could a war between the United States and Japan accomplish? What would be its end?—the Philippines ruined, and very possibly the European war lost by the Democracies."

## Co-operatives in Szechuen

A YEAR and a half of Sino-Japanese war has resulted in the quadrupling of the number of rural co-operatives in Szechuen.

From a pre-war figure of 3,393 societies that counted a total membership of 185,996 family units in May 1937, the figure has jumped to a present total of 13,000 independent co-operatives. The figure is all the more impressive when it is considered that at the time when the Szechuen Provincial Rural Co-operative Commission inaugurated the local provincial co-operative movement in 1935, there were only nine co-operative societies in the entire province.

The geographical distribution of the co-operatives has also been startling. Four years ago only eight hsien of Szechuen Province had rural co-operative societies. In 1936, one year later, the number of hsien was increased to 29; in 1937, 79, plus one municipality. To-day, co-operative societies may be found in 119 hsien and one special municipality, Chungking.

More than 85 per cent of the rural co-operatives in Szechuen are credit societies; the rest are public utilities societies, production and marketing societies. Last March, the number of credit societies was set at 11,167, with a total membership of 589,454 persons. These societies have a total capitalization of more than \$1,300,000 and are scattered through 107 hsien.

To store the agricultural surplus of last year's rich harvest, at least 1,312 of the societies constructed granaries. It is known that in March of this year there was a total stock of 236,693 *shih* of grain (one *shih* being equivalent to 160 catties, approximately) in these granaries.

With the development of credit societies has come the organization of co-operative banks in many hsien. Latest reports indicate that there are 61 such banks in the province, most of them capitalized at \$100,000 each. Large amounts have been extended to farmers as loans for the purchase of agricultural equipment, seed, and live-stock for the promotion of productive reconstruction.

When many fields were affected by drought in 1937, the sum of \$533,373 was given to farmers to buy seed. As a result, more than 223,455 households were able to continue their farming. Early this year, many buffaloes died of rinderpest. For the purchase of 2,530 of these essential animals, another loan of \$68,494 was extended.

Co-operative societies for the marketing of wood oil, sugar cane, and cotton, for all of which Szechuen Province is noted, have made satisfactory progress. By March, a total of 20 marketing societies for wood oil alone had been organized, with a total membership of 2,627. There are now three marketing societies for cotton and seven for sugar cane.

The rural co-operative movement is not confined to Szechuen. The Agricultural Credit Administration, in collaboration with the Farmers' Bank of China, the Bank of China, and provincial co-operative banks, are all helping to spread the movement throughout the nation.



# Ceylon and the British Empire

By J. VIJAYA-TUNGA, Author of "Grass for My Feet"

(The Asiatic Review)

**C**EYLON, though a small island, is admittedly of great strategic importance, and, as the model for the rest of the Colonial Empire, of paramount importance politically. Moreover, it is a country that became British, not through defeat, but by assent. As with the rest of the British Empire, the looming into importance of Ceylon, in its capacity as the premier Crown Colony, is quite accidental. By the way, this accidental muddling-through quality of the British forged, to begin with, a kindred feeling between them and the Oriental races (I suppose, with the African as well). But neither Oriental races, nor primitive races, nor Great Britain can continue with this pleasant pastime in a world now seething with plans, policies, and whatnots. Hence the need for scrutiny, investigation, and forecast.

At the risk of rousing no more than cursory interest by the use of such overworked terms as "political" and "economic," I must define Ceylon's problems as educational, economic, and political. Or we might combine the first two, for more than ever is it necessary that an individual's education should be not only in terms of culture, but also of self-survival and citizenship. With the solving of the bread-and-butter and what-to-do-with-oneself problem the political problem might appear to solve itself, but for the sake of clarity let us examine the three problems apart and in a reverse order.

## The Political Scene

I shall not stop to review the various stages of Ceylon's constitutional growth from 1815, when, by convention between the Singhalese Chiefs and the representative of the British Crown, Ceylon was ceded to England, to 1833, when her Government was granted its first "Council," to 1931, when under the terms of the Donoughmore Commission's Report it emerged with a full-fledged State Council of fifty territorially elected members, together with eight nominated unofficial members and three Officers of State. This also marked the introduction of adult franchise, a very statesmanlike measure on the part of the members of the Donoughmore Commission. Conflicts between State Council and Governor, between the Ministers and the "Officers of State" were inevitable, incidental in the working of a new constitution, and need not, therefore, in the present analysis be given undue prominence. Also there has been anxiety on the part of certain minorities and certain conservative bodies at the sight of democracy rampant in a feudal country like Ceylon. Also, faced for the first time in their ministerial career by a grave economic crisis combined with a malaria epidemic (which accounted for over 70,000 deaths), the Ceylonese Ministers found the Committee system, involving the presence of the Officers of State, hindering and vexing. Regarding these difficulties and fears there have been communications and deputations to Whitehall, but for the purposes of this analysis I overlook them.

Constitutionally, exactly where is Ceylon? England knows of Ceylon's immense strategic importance; and Trincomalee is now being built into a naval base, supplementary to that of Singapore. Though not on the England-Australia air-route, Ceylon's air-port at Ratmalana will develop in time to be one of the most important in the East. The few Ceylonese among Ceylon's statesmen who think on such lines say to themselves, contemplating these projects: "Well, they might be assets to our country some day." Actually they are more likely to be targets, the objectives of militaristic powers in Asia. In envisaging the British Empire in the East at any future date Great Britain cannot, and will not, leave out Ceylon, just as much as she would not leave out India, or Burma, or Malaya. India with its man-power is in a special category; on the other hand, countries like Ceylon, Malaya, and Burma must not imagine for a moment that they would, as they did in medieval times, be independent countries, each with its Lilliputian navy and air force. At the same time, Britain's Colonial Empire, which covers, including the Anglo-Egyptian Sudan, an area of three million square miles out of the Empire's total area of thirteen and a half million square miles (and almost the whole of it occupied by non-white races), raises a very urgent problem.

Some of the colonies, like the West Indies and Malaya, have reached a stage of political development which must soon outgrow the Crown Colony system. In this connection Britain might say in precise terms: "We need you as units of the Empire. It would be just as well for you to remain units of the British Empire. These will be your advantages. And this is as far as we intend to leave you alone to manage your own affairs; and these are the minimum concessions we need, which, considering the relationship between us and you, should appear small."

The wait-and-see policy is easy. In our individual problems it is the line of least resistance. In dealing with politically undeveloped countries it is very tempting because it seems so non-committal. But it is fraught with danger for the future. You ask the "Opposition" in a country like Ceylon to formulate their demands, and this is what they would say:

"The goal of the Congress had always been self-government within the British Empire. That was the policy laid down by its founders. They wanted freedom within the British Empire, freedom to manage the internal affairs of their country. They wanted their country to be a self-governing Dominion like the Union of South Africa, Australia, or Canada."

These words were spoken by Sir D. B. Jayatilaka, Minister for Home Affairs in the Ceylon State Council, but as one of the founders of the Ceylon National Congress and a veteran Nationalist, constituting, in a sense, the "Opposition." But you note there is no peremptory demand. They are content to wait. Their deputations to Mr. Malcolm MacDonald have involved no specific demands other than the "reform of the Constitution," and their efforts were directed, in the words of Sir D. B. Jayatilaka at a meeting of the Ceylon National Congress last year, "to secure the amendment of the Constitution so as to remove the three Officers of State, because their presence in the State Council robbed them of self-government." Considerate? I would say naive almost. Truly, despite Trinidad and Palestine, the men at Whitehall appear not to be unduly anxious about the problems of the major part of the Empire. But that is just the point. It is just at times like these, when the influences of the older generation and the traditions of the past are still exerting themselves, when there is comparative calm or manageable turbulence at worst, that our young men at Whitehall should be thinking not only for their country, but thinking ahead for countries like Ceylon.

The spearhead of discontent is already in these countries, and at each General Election the electorate of a country like Ceylon sends in to represent them in the State Council younger men, each of whom indulges in more violent denunciations and rhetoric than the one before. The Governor of Ceylon, Sir Andrew Caldecott, speaking (February 16, 1939) at a "Recall to Religion for Buddhists" meeting in Colombo, said:

"People are just seeing red, and there is no discipline or self-control to stay the thrust of the knife or the fall of the bludgeon. Whence are we to import, and how import, self-control and discipline of the mind and body?"

Earlier in his speech he had described the increase of crime in Ceylon as attributable to "unemployment and nearness to starvation." I quote these words, incidentally, in support of my contention that the spearhead of discontent is there, and that if unchecked it will take a political form, unanticipated both by the Ceylonese and the British Government. On the other hand, if Great Britain, without waiting for crises and "ugly situations" (in newspaper language), could tell the Ceylonese, who are at heart so Anglophile and quite content to be within the British Empire: "Your statesmen, new to new responsibilities, have managed things well through a critical period. If within the next five years you can show as good a record (or better), there shall be a Royal Commission to inquire into your Constitution, with a view to self-government in the sense Australia and Canada are self-governing."

Such a gesture would prevent any plans that Berlin or Rome or Tokyo might be waiting to precipitate on important nerve-centers



of the Empire such as Ceylon is. It would take the wind out of the sails of local political discontent; it would enable the people and their administrators and executives to concentrate upon economic and social problems.

### Economic Problems

That the latter are of a very urgent character must be emphasized in passing, even though it might sound somewhat of an anticlimax. Ceylon's economics must be essentially in terms of agriculture. And this must not be taken to include rubber and tea. It is, I believe, beginning to be realized that to regard any part of the Empire (or, for that matter, any one part of the earth) as a milch-cow for the rest is suicidal in the long run. It is admittedly a credit to the first State Council (1931-35), under the new Constitution, that it took in hand agricultural and irrigation schemes. Until recently large tracts of land were sold to capitalists for tea and rubber cultivation, both industries being, incidentally, dependent upon immigrant labor. In recent years there has been some check to immigrant labor, but 534,000 acres of rubber and 457,000 acres of tea together still employ 550,000 immigrant laborers.

While the country has been concentrating upon export commodities like tea and rubber, which are at the mercy of a world output, the cultivation of Ceylon's staple need—namely, rice—has been overlooked. Half of Ceylon's food bill of Rs. 110,000,000 (Rs. 1,000 equal £75) in 1935 was on account of imports of rice. The area under rice cultivation, 850,000 acres, is quite inadequate. At least an extra 2,000,000 acres must be cultivated to provide enough rice for Ceylon. Ten million out of Ceylon's area of 16,000,000 acres is uncultivated land. The people cannot be blamed altogether for this state of affairs because agriculture is dependent upon irrigation, and this is a provision which the Government must make. How much this department of the public service has been neglected can be seen when we realize that "the extent of land irrigated at present" (to quote from the Government Report for 1933, the latest available) "under major works is 152,348 acres, and under restored village works 206,239 acres."

These figures are closely linked to the 70,000 and more deaths during the malaria epidemic of 1934-35. Sir D. B. Jayatilaka, Minister for Home Affairs, when he was in London for the last Imperial Conference, gave me an interview, in which he said:

"If the origin of the epidemic was due to climatic conditions, it is no less certain that its persistence and the resultant high mortality were due to the bad economic conditions. To prevent the recurrence of such a calamity in the future it is not only necessary to introduce preventive measures, but also to raise the standard of living among the people and increase their earning capacity. One step towards this is to provide the landless with land. Fortunately, a new scheme for providing land for the peasants and middle-class Ceylonese on easy terms has already been inaugurated under the new land policy. No land can now be sold to capitalists until sufficient land has been reserved for the needs of each village. Within the last four years between 80,000 and 100,000 acres have been granted as peasant holdings."

### Education

Here we touch that universal malady—the dislike for work on the land while a few miles away there is the city with its glittering lights and all the tinsel temptations that go with it. A shop-salesman or clerk or travelling salesman from the city can go into a village and put the robust rustics to shame, because of the inferiority complex civilization has heaped upon the latter. This is true of England; it is true of Ceylon. The farmer in Ceylon (farming in a primitive but withal self-sufficient way) does all he can to give his son an English "education," so that from that generation on his family will be "gentlemen."

In 1923 a Committee was appointed, under the chairmanship of Mr. Ormsby-Gore (now Lord Harlech), to report on Education in Tropical Africa. And what they said in that Report in the following clause applies to Ceylon (and India, Burma, and Malaya):

"Education should be adapted to the mentality, aptitudes, occupations, and traditions of the various peoples, conserving as far as possible all sound and healthy elements in the fabric of their social life, adapting them where necessary to changed circumstances and progressive ideas. Its aim should be . . .

to promote the advancement of the community as a whole through the improvement of agriculture, the development of native industries, the improvement of health, the training of the people in the management of their own affairs, and the inculcation of true ideals of citizenship and service. It must include the raising up of capable, trustworthy, public-spirited leaders of the people belonging to their own race."

We do not want an expensive Commission from England (whose expenses will fall both upon the English and Ceylonese taxpayer), but half a dozen English officials in Ceylon with another half a dozen Ceylonese, representative of the various communities, could find out in three months the kind of education Ceylon is crying out for.

To sum up, then, Ceylon's problems are political, economic, and educational. A start must be made in all three fields simultaneously. Let England give the lead with regard to Ceylon's political goal. Let the Ceylon State Council have all the encouragement and advice in its efforts at agricultural and irrigation and other economic recovery projects. And again, let England take the initiative (while through economic recovery starvation is reduced and economic security is established) in giving a healthy orientation to education. For political power in the hands of a semi-educated, ill-educated electorate is a great danger and invites the nostrums that are thickly flying about in the world to-day. There is not sufficient vision nor the statesmanship among the Ceylonese of to-day worthy of Ceylon's great historical past—chiefly due to their mis-education—but there is (as there always has been) that valuable quality of adaptability among my countrymen. This could be turned to good ends, and it is worth England's while to take a hand in real earnest. Then it might be possible for us to echo the hopes expressed by Lord Snell in his broadcast in America some time ago, and Ceylon (and the rest of the Colonial Empire) might be really content "to live and grow under the general principles of the British Constitution."

## New 1940 China Hong List Appears

THE book that "tells all" about the Port of Shanghai and contains also an immense amount of detailed information regarding other centers in China has just appeared in a new edition. This is the red-backed China Hong List of the *North-China Daily News*, Shanghai's city directory. This 1940 edition of the Hong List presents clear evidence that despite all the many adverse conditions that have developed in East Asia, the City of Shanghai continues to achieve a measureable degree of progress. The 1940 Hong List with its 938 pages is a bigger book than its predecessor in 1939 by about thirty pages.

The thing that makes the China Hong List an indispensable reference book for every ordinary individual in China is its completeness, because, in addition to other valuable features, it is a business and residential directory of all foreigners and leading Chinese in the principal ports and cities of China. A new and up-to-date map of Shanghai, provided at a slight additional cost, accompanies the new 1940 edition of the Hong List.

Such incidental information as the dates of race fixtures, English and Chinese calendars, festivals, national days and customs and bank holidays are to be found in the Hong List along with dates of eclipses in 1940, postal union rates, the Jewish calendar, Weights and Measures. The Shanghai Hong List proper includes in alphabetical order the names of firms doing business in Shanghai, an Agents directory listing agencies abroad operated by Shanghai firms and a Trade directory. These lists are followed by a Who's Who consisting of a list of foreign residents with their business addresses, a Street Directory of Shanghai and a Residential directory.

In conveniently cut sectional indexes complete information is given listing firms and residents in all the main centers in China and in Manchoukuo as well—no less than forty-five cities. The book lists the officers on coastal and riverine steamers, a Diplomatic and Consular Directory, and lists also Protestant and Catholic Missions with their personnels.

An indication of the widespread demand for the book was given this year when within three weeks of its appearance the initial issue was sold out necessitating a second edition now on sale at the *North-China Daily News* office and at all booksellers. The price of the new China Hong List with the Map of Shanghai is \$23. The price of the map alone is \$6.



# The Nickel Industry in 1939

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**W**ORLD consumption of nickel in all forms during the first ten months of 1939 totalled 206,000,000 pounds. This figure is comparable with 160,000,000 pounds and 201,000,000 pounds consumed in the like periods of 1938 and 1937, respectively.

Due to increased sales of nickel during the last quarter, principally in the United States, the world undoubtedly will use more nickel in 1939 than in any previous year in the life of the nickel industry.

This record consumption of nickel may be attributed to the great improvement in the heavy industries in the United States and Canada, and to the general speeding up of industry in Europe and other parts of the world, in order to augment the production of necessary war supplies.

New applications of nickel developed during recent years accelerated substantially the consumption of nickel steels and alloys in a great diversity of forms and compositions.

A sustained effort through technical research, development, and publicity over past years has brought about a well-nigh universal knowledge of the value of nickel. The metal is now used directly or indirectly in the satisfaction of practically all human needs. As the text of this article shows, nickel is used in the production of food, clothing, automobiles, and heavy machinery of all kinds. In fact, its range of usefulness for a multitude of applications extends from the coin in one's pocket and the wire in the electric toaster, through the steel in the automobile and tractor, to the armor plate on the largest battleship.

With this great diversification of uses for nickel, it follows that the trend of consumption now parallels closely the curve of world industrial production as a whole, and should continue to do so.

This "Review of the Nickel Industry in 1939" gives, as briefly as possible, a factual summary of the uses of nickel made by industry throughout the world, with emphasis on new developments made during the past year.

## Estimated World Nickel Consumption

Although the total world figures for the year may show minor variations, the following estimated percentages give a general picture of the various forms in which nickel entered world industry in 1939:

	Per Cent.
Steels . . . . .	60
Constructional Steels, Stainless Steels and Other	
Corrosion and Heat Resisting Steels, and Steel	
Castings	
Nickel Cast Iron . . . . .	3
Nickel-Iron Alloys . . . . .	1
Nickel-Copper Alloys and Nickel Silvers . . . . .	10
Nickel Brass, Bronze and Aluminum Alloy Castings . . . . .	2
Heat Resistant and Electrical Resistance Alloys . . . . .	3
"MONEL," Malleable Nickel, Nickel Clad, "INCONEL" . . . . .	10
Electrodeposition . . . . .	8
Non-metallic Materials for the Chemical Industry . . . . .	1
Nickel Salts, Ceramic Materials, Storage Battery, Materials and Catalysts . . . . .	
Miscellaneous and Unclassified . . . . .	2

Nickel is used largely in alloys. Developments in these alloys during the year have substantially increased the consumption of nickel by all industries.

## Wrought Steels

An important extension of markets was observed for the strong, low alloy, corrosion resisting steels. Marketed as proprietary products by leading alloy steel producers, a majority

of these steels now are of the nickel-copper alloy type. As rolled, they combine moderate cost with improved strength properties and highly satisfactory response to shop fabrication, including cold forming and welding, and they have improved resistance to corrosion in the atmosphere and certain other environments.

Volume increased markedly, and these steels have become useful in railroad rolling stock, in the mining industry, in oil field tubular goods, in truck tanks, trailer frames, etc.

Nickel continued to occupy a primary place in the field of heat treated constructional steels. A low cost, low alloy nickel-chromium steel, introduced commercially a few years ago, is in use for front-end parts of a prominent passenger automobile, and during the year found applications in other fields.

Nickel-chromium-molybdenum steels of certain types have become recognized as providing machinability at high hardness. Their selection is indicated when accuracy and fine finish necessitate machining after heat treatment. Steels of this type, fully treated, are now carried regularly in the warehouses of steel distributors.

Precipitation (age) hardening, long used to develop improved performance qualities in non-ferrous metal alloys, has begun to be useful in certain constructional steels containing nickel. Such processes of hardening have been applied to structures of the nickel-copper alloy steels, which, by reason of their large size and complex shape, could not be treated by other methods. Nickel nitriding steels, susceptible to age hardening, have been applied in aircraft engine gudgeon pins and in oil field tools.

A large volume of nickel found its way into normalized or annealed steel forgings and castings for heavy machinery parts where, because of size and shape, quenching and tempering for improvement in properties is ineffective or cannot safely be applied. Included were turbine rotors, heavy shafting, ships' machinery, large gears, and similar products.

During the year, further advances were made in the welding art, in methods of hard surfacing and in selective heat treatments such as flame hardening and hardening after induction heating. Among the nickel alloy steels are types suitable for each of these processes.

Alloy steels amenable to hard surfacing and selective heat treatments, provide parts, which combine improved abrasion resistance with high strength and toughness required to meet the severe performance needs of modern industry.

Good welding qualities of many of the low carbon nickel alloy steels have contributed to their use in pressure vessels for low temperature service, in welded transportation units, road building and contracting equipment, etc.

Suitability for the processes mentioned has been reflected in broader markets for the nickel alloy steels.

## Stainless Steel

Final figures for stainless steel production for 1939 are expected to exceed 1938, when 85,000 gross tons were produced in the United States alone. Manufacturers have enlarged their facilities, and improved their methods of rolling this useful alloy steel. The improvement in the product and the extension of the knowledge of fabrication techniques have expanded the markets.

Nickel ranging from eight per cent to 26 per cent\* is an important constituent in the major portion of the production of stainless steels. The well-known type "18-8," containing normally 18 per cent chromium and eight per cent nickel, accounted for more than half of this production. The trend definitely favors both the nickel steels and the use of larger percentages of nickel. Next to the constructional steels, it represents the largest market for raw nickel.

\*Typical chromium and nickel percentages arranged in order of chromium content are: 8-20, 18-8, 18-8-4 Mo, 18-12, 18-26, 18-35, 25-12, 25-20, 26-24, etc.



Metallurgically, the most important features have been the expanding use of additional alloying elements, such as molybdenum and columbium, and the introduction of new types, such as the "lead stainless," to the already successful free-machining stainless steels. During the year attention has been directed to the improvement of stainless steel by the addition of small quantities of silver. Because of the difficulty of dissolving silver in the steel bath, it is usually added in the form of an alloy of 95 per cent nickel and five per cent silver.

### Castings

The use of nickel by ferrous and non-ferrous foundries during 1939 increased substantially. This is partly due to the increased production rate of the foundries but chiefly to the extension of the uses of nickel. The year has been outstanding in the progress made by foundries and their customers in developing standard specifications to define composition and properties. The foundries have achieved recognition of the fact that they are able to offer a product as dependable and uniform as the rolling mills.

Nickel continues to be a fundamental addition in alloy cast irons, to control the structure and to secure better properties. Nickel alloyed truck and airplane brake drums have shown a life several times longer than plain cast iron. Specially processed high strength irons, to which nickel and sometimes other alloys are added, have increased in popularity. Tensile strengths exceeding 70,000 pounds per square inch are thus secured. Applications include gears, crankshafts, machinery frames, hydraulic pressure castings, and roughing, shaping, and billet mill rolls. During the year there was developed a higher carbon, high strength iron with non-galling characteristics particularly suitable for lathe heads and reciprocating parts, where high pressures and wear are encountered. The use of heat treated cast iron dies containing up to three per cent nickel increased. Nickel improved its position in the field of white (chilled) cast irons. Low cost grinding balls for ore grinding have been developed, and there was increasing use of "NI-HARD", containing up to 4½ per cent nickel, for rod and ball mill liners, where abrasion resistance is desired. Additions up to 40 per cent of nickel are being used to secure special physical properties, such as controlled expansion and resistance to corrosion.

Cast nickel steel continues to be used by railroads for cast locomotive frames and nickel-manganese steel for the truck casting of light weight freight cars. Nickel-molybdenum steels are giving excellent service for oil rig brakedrums and nickel-chromium-molybdenums for swing hammers and crusher roll shells in mining and quarrying. The use of the latter cast steel in rolling mills has increased for blooming and roughing rolls. For tubing piercer points it is practically standard.

Small quantities of nickel added to bronze, often replacing tin, increase the density and better the anti-friction properties. During the past year the American Society of Mechanical Engineers published data showing that three per cent of nickel increases the resistance to corrosion and to cavitation of manganese bronzes. Age hardening bronzes have better physical properties with five per cent of nickel added and one per cent of nickel in tin-base babbitt metals improves the physical strength.

### Non-ferrous Mill Products

Non-ferrous mills are running neck and neck with steel mills in promoting recently developed products that eliminate weight through higher strength, resists corrosion, or cut down fabricating costs. It is by no means a competitive race, as the two groups perform in different fields. Non-ferrous metallurgists have been as active as steel metallurgists in developing new and improved products which have been as actively promoted.

Supplementing regular products such as aluminum, brass, copper, nickel-silver, "MONEL" and nickel, the non-ferrous mills have developed and are promoting a number of non-ferrous alloys that can be hardened thermally. The most recent development is "Z" nickel—a 98 per cent nickel alloy that will develop 160-240,000 p.s.i. tensile strength with corresponding hardness. Rust-proof fish hooks for salt water use have recently been made of this alloy which is being employed for many other wire and strip products such as springs, diaphragms, camera parts, automobile antennæ and high strength rust-proof wire rope. Other recent developments in hardenable non-ferrous alloys include

"K" "MONEL" and a casting alloy "S" "MONEL" used for valve seats and similar purposes, because it retains a hardness of 320 to 370 Brinell at 1100° F. and has excellent resistance to galling.

The demand for marine condenser tubes with greater resistance to corrosion and erosion by salt water continues to be adequately served by 70-30 cupro-nickel in substantial quantities, and the non-ferrous mills in England and the United States have been successful in promptly supplying the quantity and quality needed.

Sales of nickel silver have also shown a substantial increase in 1939. In England, considerable advance has been made in the technique of extrusion and it is now possible to produce shapes with a nickel content as high as 20 per cent. Its white color and workability are reasons for its increasing use, particularly in strip form. Electrical instrument parts and clothing slide fasteners illustrate the usefulness of nickel silver.

Nickel clad steel recently was augmented with "MONEL" clad steel and "INCONEL" clad steel. "INCONEL" is a stainless alloy containing approximately 80 per cent nickel, 13 per cent chromium, and 6.5 per cent iron. "INCONEL" clad steel is making substantial headway in heavy equipment for processing fatty acids and other materials associated with soap making. During 1939 the largest clad plates ever rolled were produced in nickel clad steel. These ¾ inch ten per cent clad plates measured 152 × 151 inches and weighed 5,315 pounds each.

Contrasting with these large plates was a seamless nickel tube believed to be the smallest tube in the world. The tubing runs about 11 miles per pound and measures 26/10,000 inch outside diameter.

In addition to free cutting brasses and bronzes, manufacturers of screw machine products now have "R" "MONEL", recently developed for use in fast production of small items such as needle valve parts and machine screws.

### Heat Resisting and Electrical Resistance Alloys

Where annealing, heat treating, nitriding or carburizing is done, the permanent equipment supporting or protecting the work is almost always made of the nickel-chromium-iron alloys with nickel content ranging from 85 per cent to ten per cent and chromium from 35 per cent to 15 per cent, balance iron. Nickel is useful in extending the life of the equipment, both by increasing the strength at high temperature and by developing a tenacious scale resistant to further oxidation. In general, furnace atmospheres determine the nickel and chromium contents.

Light weight fabricated boxes of "INCONEL" sheet are replacing heavier cast carburizing boxes. The use of "INCONEL" and "D" nickel is being extended in enameling furnaces to avoid scale falling on the enameled ware.

The application of radiant tubes of high nickel alloys has increased during the year; one furnace manufacturer has used 500,000 pounds for this purpose alone in 1939. For cast pots to hold molten lead used in the heat treatment of steels, an alloy of 60 per cent nickel has been found to give over 20,000 hours of service. "INCONEL" and other high nickel alloy tubing is used to protect the material in heat treatment furnaces—particularly of the continuous type.

A continually increasing number of industrial furnaces are heated electrically. The electrical resistance wire (usually 80 per cent nickel, 20 per cent chromium) is the same as used in the breakfast table toaster, and small analysis changes over the last few years have increased this alloy's life tenfold.

The extension in the use of electrical heating appliances in the home, as well as the development of industrial electric furnaces for controlled heat treating technique have been responsible for a 30 per cent increase in the sale of nickel-chromium wires in 1939. One type of furnace uses tubes for the actual heating elements and thereby permits uniform air circulation.

A copper-nickel alloy wire which maintains a constant electrical resistance is used in recording instruments. A high nickel-manganese wire serves where special furnace atmospheres must be withstood.

### Coinage

Since 1881, when Switzerland first adopted pure nickel for coinage, 34 countries have issued pure nickel coins in 90 denominations

\*Trade-mark of The International Nickel Company.



and 104 designs, of an estimated total weight of 45,000,000 pounds. The latest addition is Argentina, where the Minister of Finance on April 18, 1939, authorized the issuance of 10,000,000 pieces of pure nickel in the new denomination of 50 centavos, the first coin of this denomination to be issued by Argentina since 1897, when the coinage of silver was discontinued. Argentina is the third Latin American country to adopt pure nickel for one or more fractional coins.

Although we have no record of other new issues or designs during the year, many countries have been active in minting pure nickel coins. Most active has been Belgium, where over 1,200,000 pounds of coins were issued in three denominations—5 francs, 1 franc and 50 centimes.

Of the 139 coin issuing countries for which statistics are available, over one hundred have used nickel, either in its pure state or as an alloy, as a part of their coinage systems at some time during their monetary history.

The most widely used coinage alloy of which nickel is a component is a copper-nickel alloy composed of 75 per cent copper, 25 per cent nickel. This was first used by Belgium in 1860, subsequently adopted by the United States in 1865 for a three-cent piece, and later used for their five-cent piece, the well-known "nickel." Since 1880, there have been issued over 16 billion pieces of cupro-nickel alloy in 291 denominations, with an estimated nickel content of 40,000,000 pounds.

### Electroplating

Although nickel plating was one of the earliest uses of nickel, the amount of nickel so used continued to expand in 1939. Improvements in technique and a better appreciation of inherent values of nickel led to wider adoption of nickel plating for physical strength and protection, as well as decoration. Progress has been made in bright plating, which reduces finishing cost; and in the adoption of automatic devices, which give more rapid and economical production.

The automotive industry is still the largest user of nickel electroplating. The lasting quality of brilliant chromium plate has been enhanced by a thicker and more durable underlying coating of nickel. Production facilities and uses of nickel plated steel sheet and strip have increased during the year and heavier deposits are now available for improved durability and weather resistance.

Typical of heavy deposits was the covering of rolls for handling hot glass, with .005" nickel plate. These rolls were of steel, nearly 18 feet long and 6 inches in diameter. The installation was made following a full year of service at high temperature of a previous set of rolls of the same length and 13 inches diameter. Both the first and second sets of nickel plated rolls are operating satisfactorily.

A patented process of plating at great speed has been responsible for a new product, an electrodeposited nickel screen of controllable size and design, which has advantages over wire mesh or perforated sheet.

A review of the year's developments shows an extension of the use of nickel and nickel alloys in the principal world industries.

### Nickel in the Automobile Industry

Production of automobiles in the United States and Canada during the first ten months of 1939 increased 57 per cent over the like period a year ago and was substantially higher than for the full year of 1938. Conditions in the British automobile industry during the first nine months were much better than in the previous year, and, in the case of some firms, record outputs were established.

Busses and trucks continue to extend their uses of nickel steels because of the severe service and the insistence of owners on low maintenance costs. The competitive situation in the passenger car field in Canada and the United States continues keen. Labor costs have increased in the past year, but car prices generally have been maintained at more or less the same level, and material costs have been under pressure. A slightly lower quantity of nickel has been consumed per passenger car during 1939, though developments indicate an upward trend in the use of nickel steels. In addition to established uses, all passenger cars and trucks now use some form of nickel alloy steel for exhaust valves.

In the racing field interest was aroused by two extremes of cars, i.e. John Cobb's giant racing car, powered with two Napier

Lion twelve-cylinder supercharged water-cooled engines each developing 1,300 horse-power, with a total weight of about three tons, and the small 12 horse-power M.G. car driven by Major Gardner. John Cobb at Salt Lake Flats increased the world's unrestricted record to 369.74 miles per hour, and, remarkable as was this achievement, it must be compared with that of Major Gardner, who, in his small six-cylinder (1086 cc) car, attained a speed of 203.16 miles per hour on the special Autobahn at Dessau. Nickel alloy steels and light alloys were extensively used for all the highly stressed parts in both cars. They were likewise generously applied in the British eight horse-power class of car, in the design of which further advances were made by fitting larger bodies together with engines of greatly improved performance.

The value of nickel alloy steels in attaining maximum carrying capacity with the minimum of weight and, at the same time, the maximum of reliability is exemplified in the "Mammoth Major," an eight-wheel lorry having a maximum laden weight of 22 tons, made by one of the leading United Kingdom manufacturers.

In England a new light aluminum alloy, containing nickel, has been developed for bearings. After exhaustive road tests, this alloy is now being fitted to big-end and main bearings of automobiles and commercial vehicles.

The magnetic characteristics at low temperature of 29 per cent nickel-steel are utilized in generators and speedometers. Small pieces of nickel-steel operate at low temperatures to increase automatically the charging time of the generator or to correct the speedometer reading.

A United States automobile manufacturer has adopted a so-called choke stove, which gives quick cold starting and permits a much shorter warm-up period. A tube of "INCONEL" runs through the exhaust manifold, where it is directly in the flame.

The use of over-drives is now standard equipment on several cars, where previously it was optional. This is resulting in an increased consumption of nickel because nickel steels are used extensively in these parts.

### Nickel in Tractors and Farm Implements

The steady increase in the mechanization of farming, to conserve manpower, has not been retarded during 1939 by war preparations.

Increasing use of the track-laying tractor for mining; lumbering, farming, building, and manufacturing resulted in larger production in the past year. As a result of greater interest in this type of tractor for farming purposes, several new small models with adjustable treads for planting, cultivating, and harvesting various row crops were introduced during the year.

The same alloy steels were adopted for these new models as those used in the old established models—principally nickel, nickel-chromium and nickel-molybdenum steels for such parts as transmission gears and shafts, bevel ring gears, sprocket shafts, bull gears, and bull pinions.

Output of wheel type farm tractors in Canada and the United States reached approximately 200,000 units for the year. Design trends continue along the lines of greater power, more speed and more silent operation, all requiring stronger materials. Several developments during the past year resulted in increasing the nickel content of the steels being used or changing the part from a plain carbon to a nickel steel. Changes of this sort took place on speed reduction gears, bull ring gears, master pins, front idler shafts, and are being contemplated for transmission gears on several models, by which power can be increased 15 per cent to 20 per cent.

A dozen new wheel type models were introduced during the year. Of these new tractors, three were 15 drawbar horse-power, falling in the low cost small tractor group, which has become a field of increasing importance to the tractor manufacturer. Because of the substantial power developed in proportion to size, nickel alloy steels were generously used in two of the three models with satisfactory results.

United States and Canadian production of hand garden tractors during 1939 is estimated at approximately 20,000 units of all sizes from half to eight horse-power. The use of nickel has increased rapidly in these small units. A producer for one of the United States mail order houses recently adopted a nickel-chromium steel for transmission gears in its models. The nickel content in



axles was also increased, in order to take care of the increased power and performance requirements.

Plows, which have customarily operated at two to three miles an hour, are now being designed for four or five miles an hour, and a similar speeding up of operations is being applied to planting, cultivating and harvesting.

Plow-share producers recognize the need for stronger steels while operating under these conditions. Consequently, during the year experimental high carbon nickel-chromium and nickel-molybdenum shares were placed in test in all types of soil throughout Canada and the United States. The disc type plow continues to be the principal application for high carbon nickel-chromium steel.

### Nickel in Aviation

The remarkable technical and commercial advances that have been recorded by the aviation industry during the past few years reached new heights in 1939. Indicative of present volume is the situation in the United States where manufacturers had at the end of 1939 unfilled orders of over one-half billion dollars. Although much of this activity has been due to military demands, commercial airlines have had tremendous growth and both the Atlantic and Pacific are now regularly spanned by giant seventy-two passenger ships.

Some idea of the importance of this industry to metals is gained from the estimate that the United States manufacturers will have used in 1939 approximately forty-three million pounds of metals and alloys. Large quantities of nickel bearing ferrous and non-ferrous alloys are included in this.

In England and the United States over 500,000 pounds of "INCONEL" were consumed during the year for exhaust manifolds, cabin heaters, flash boilers and exhaust gas turbines, where the oxidizing and corrosive influence of high temperature gases formed by the combustion of high octane fuels must be resisted. For horse-powers over 1200, "INCONEL" is standard and, for smaller engines, a stabilized stainless steel containing upward of eight per cent nickel is employed.

Nickel alloy steels are used for the spider and other parts of the modern controllable pitch propellers and for vital parts throughout the power plant where a high ratio of strength to weight is important. Nickel-chromium-molybdenum steels, heat treated to high tensile strengths, are used for the structural parts of the undercarriage and two per cent nickel cast iron has proved itself for brakedrums on the landing wheels. Nickel stainless steel is being adopted for structural parts—at present largely in stabilizers, rudders and elevators.

Substantial quantities of non-magnetic "K" "MONEL" are used for instruments and for small structural and operating parts adjacent to the compass.

### Nickel in the Railway Field

The last few months of 1939 witnessed a decided improvement in orders for equipment placed by Canadian and United States roads.

One of the most recent applications of nickel in railways is in the Hudd system of safety signalling, which has proved so successful in Great Britain. This system depends on the use of large magnets, each weighing 45 pounds, made from the nickel-aluminum-cobalt alloy steel Alnico, which are placed between the rails and operate to stop the train at any speed, unless an electric magnet counteracts.

The locomotive of the Coronation Scot, the New York World's Fair exhibit train, was fitted with high tensile nickel-chromium steel connecting rods, nickel steel boiler and "MONEL" staybolts. Twenty locomotives of this "Pacific" type are now being constructed in the United Kingdom for long distance runs.

Nickel iron is important to Diesel engine manufacturers for cylinders and other parts, and its use is keeping pace with Diesel development in England, America and many European countries.

Nickel is now playing a leading part in brass castings in the railway field, replacing part of the tin used. Recent developments in nickel-bronze alloys, containing up to ten per cent nickel, for locomotive and other types of steam piston rings, have opened up another important field for these tough, long wearing alloys.

The South African Railways recently secured sixteen Beyer-Garratt locomotives for operating on the Johannesburg-Zeerust-

Mafeking line of 3-ft. 6-in. gauge. These have two per cent nickel steel boilers and outer fire boxes similar to the 600 locomotives in Canada and the United States which also operate at high boiler pressures.

The Brazilian Government, the Canadian National, the Canadian Pacific and the Union Pacific Railroads have recently purchased locomotives and light weight cars with cast nickel steel or nickel manganese steel truck castings. Several of the Western roads in the United States have standardized on austenitic manganese steel containing 3.5 per cent nickel for frogs and crossovers in trackwork, because of its ready weldability by metallic arc.

### Nickel in Shipbuilding

Greater shipbuilding activity throughout the world in 1939, occasioned by the demands of international trade and national defense, has intensified the search for alloys resistant to sea water attack. Nickel as an alloying element in copper and iron plays an important part in the defense against corrosion by sea water.

The trend toward nickel alloys for shipbuilding is shown by the increased use of copper-nickel alloy tubing for marine condensers and salt water lines, and by trials of nickel-copper alloys for propellers to operate at high speeds and under high power.

The *Queen Elizabeth*, like her sister ship the *Queen Mary*, will be equipped with 70 30 cupro-nickel condenser tubes. The new flagship of the Holland-America line the *Nieuw Amsterdam*, and the United States liner *America* also have condensers tubed with this alloy.

Marine engineers, long recognizing the necessity of "MONEL" for high temperature steam, are now using "MONEL" valve parts in bronze valves handling water, oil, compressed air and wet steam on shipboard.

Cast "MONEL" impellers for pumps handling either salt or fresh water are being more widely used than ever in England and much interest is being shown in the use of nickel-bronze as a substitute for gunmetal and phosphor bronze.

"MONEL" in sheet form continues to be applied extensively in refrigerator linings and for trim in galleys and pantries on shipboard, since it has proved to be the most resistant alloy to the type of corrosion encountered in this service. The high strength and non-magnetic properties of "K" "MONEL" are being found increasingly useful on shipboard.

### Nickel in the Mining Industry

World-wide progress in mechanization of ferrous, non-ferrous and coal mines during the last decade has been continued in 1939. Many mines for the first time have taken full advantage of the equipment available for the mechanization of their mining and milling operations. Deep level mining, increased labor costs, and taxes have accelerated this trend. For equipment to withstand hard service and to resist abrasion and corrosion, nickel steels and nickel cast irons are being employed.

A large Canadian gold mining company is using 18-8 stainless steel for cages capable of hoisting 66 men. With a similar alloy, a French colliery has increased the life of their sludge sieves over five times. Nickel cast iron grinding balls have in many instances replaced forged steel balls. A copper mine on the island of Cyprus has decreased ball wear rate to about one-fourth, besides saving money on the initial cost of the chilled cast nickel iron ball. The annual consumption of all types of grinding balls used in the United States for milling non-ferrous ores exceeds 100,000 tons, and the world figure is undoubtedly several times this tonnage.

Large quantities of "NI-HARD," as liners of grinding mills, have been installed this year in Canada and the United States, and a gold mining company in the Belgian Congo has standardized on "NI-HARD" crushing shells. The experience of gold mines in South Africa, copper mines in Peru, and the lead-zinc plants in the United States with "NI-HARD" mill liners and trunions indicates up to 50 per cent more life than with abrasion resisting steel.

In the Summer of 1939, a Canadian steel producer made thirty tons of a high carbon nickel-chromium abrasion resisting steel for mining applications requiring increased resistance to wear.

"S" "MONEL" castings are being used in diamond drill bits to replace carbon steel as a matrix for the diamonds. Nickel copper steels are becoming standard for booms of power shovels, skips and gauges, and a United States copper company obtained



ten per cent weight reduction in ore cars by the use of these steels.

Nickel-chromium-molybdenum steels have been adopted for large churn drill bits and for forged dipper teeth on power shovels. In Great Britain, a producer of one type of detachable drill bit employs nickel-chromium steel studs to attach the bits to the four per cent nickel steel drill shanks. A survey of 30 Canadian mining and milling operations, conducted in the Fall of 1939, showed all using nickel alloys in one form or another, and 28 using "NI-HARD" in their grinding circuits.

### Nickel in the Petroleum Industry

Although world consumption of oil has increased slightly during 1939, production has had no trouble keeping pace and, except in Illinois, U.S.A., there have been no outstanding developments of new fields. Larger yield and higher quality of products have been the aim and achievement of refining. Among recent developments have been catalytic cracking and Alkylation. The growth of synthetic organic chemistry based on petroleum and the increasing appreciation of the effect of corrosion on equipment life have brought into further use corrosion resisting alloys.

Outstanding in the production of oil has been the adoption of high strength nickel-copper steels for the rotary drill pipe. Because the high speed turning force of the drill is transmitted from the turntable on the surface to the bit through the length of several thousand feet of drill pipe, high mechanical properties and corrosion resistance are important. For the massive drill collars and the long "Kelly" bars driving the rotary tool, nickel-chromium steels find wide application.

When the well is pumped, the "polished rod" working in the box at the top of the well is in many cases subjected to severe corrosion. "MONEL" "polished rods" have proved especially serviceable in the West Texas and Kansas wells. Nickel-molybdenum and nickel steels are used for the majority of the alloy sucker rods.

In the refining end, corrosion resistance is an important property. Nickel chromium steel (18-8) is being increasingly used for liners where sulphur in the hot gases is the principal attacking agent, and "MONEL" where water is present. "MONEL" clad steel has lately been introduced for protecting refinery equipment operating below 500° F. In many cases, liners, valves, and pistons of reciprocating pumps are made of "NI-RESIST"\*, an austenitic corrosion resisting cast iron. This alloy is used for the casing and impeller of centrifugal pumps. The comparatively low cost of this material prompts its consideration where corrosive petroleum products are handled.

The trend in refineries is toward increasingly lowered temperatures in fractionation of gases. In 1939, heat exchange equipment and fractionating columns were put in operation at temperatures approaching -200°F., utilizing low carbon nickel steels, because they maintain satisfactory impact values at these temperatures.

### Nickel in the Chemical Industry

The 1939 developments in the chemical industry have accentuated the progress that leading countries have made in the last few years toward becoming independent of certain raw materials. Coal, air, and limestone form the basis of a great variety of products, such as dyes, plastics, nitrates, fertilizers, and special synthetic substitutes like Nylon and Neoprene. The sow's ear proverb has been outmoded by useful industrial products made from wood pulp, milk, and vegetables.

Curtailed export of tung oil from China to the United States has resulted in the development of a satisfactory domestic substitute from vegetable oil. In this process, "INCONEL" is used for stills to prevent discoloration. This is a typical instance of translating a laboratory process to full scale production, with the necessary support of production technique and suitable materials.

The widespread use of pure nickel in the caustic soda industry for processing equipment has led to its use for storage and dilution tanks handling liquid 70 per cent caustic, and also to active interest in its suitability for tank cars.

Metallic contamination must be avoided in order to spin viscose fiber under tension and to secure high properties. Here, and synthetic resins, stainless steel, nickel, "MONEL," and "IN-

CONEL" are being successfully used for the processing equipment, as well as for transportation and storage of the raw materials. In the dyehouse, where rayon and other materials are finished, nickel alloys are protecting fragile materials and delicate shades. The British textile plants are continually adopting more nickel iron to reduce the weight of moving parts and to withstand cam and gear wear.

Soap plants, too, have extended their facilities for storage of raw materials, and nickel and "INCONEL" clad steel are being used for tanks. Plates and frames for special filter presses are using 30 per cent nickel iron.

"INCONEL" in tanning drums is protecting the coloring of fine leathers, and, in pharmaceutical plants, is preventing metallic contamination in the processing of glandular extracts.

### Nickel in the Pulp and Paper Industry

The ingenuity of paper technicians in utilizing natural resources is illustrated by a new plant in Texas, U.S.A., which makes keraft newsprint from jack pine, and another mill in Florida, which makes sulphite pulp from the same wood, long considered entirely unsuitable. The equipment used in these plants includes large amounts of nickel-chromium steels, molybdenum stainless steels, and "MONEL." For the pulping equipment in the sulphite plants, stainless steels are standard, while in kraft mills "MONEL," nickel cast irons and nickel steels are extensively employed in pulping and caustic recovery. In pulp finishing and paper making equipment, "MONEL" and stainless steels are being widely used for washing, screening, bleaching, and refining.

In the black liquor evaporators employing forced circulation and high concentration, chromium nickel stainless steel and "INCONEL" have been found to be most satisfactory. For the less severe conditions in the final evaporators a five per cent nickel steel appears to be the most economical.

"K" "MONEL," used for the wet creping doctor, has outlasted heat treated steels by more than 20 times.

Laws requiring proper disposal of waste sulphite liquor have introduced by-product recovery operations, which create new uses for nickel alloys. Stainless steel is being used for the evaporators and pure nickel is used for vanillin, one of the by-products.

Both "MONEL" and stainless steel have been recently adopted for stock lines and troughs used in the pulp bleaching operation. An innovation in pulp washing and thickening equipment has been the substitution of "MONEL" or stainless steel strip box-strapping to replace the usual binding wire. The more important applications of "MONEL" have been in connection with paper machine parts. It is becoming standard for flow boxes, save-all pans, suction boxes, fourdrinier frames and rails, slicers, and deflectors, and it is being extensively used for covering rolls, such as wire rolls, felt rolls, and table rolls.

### Nickel in Hydro Projects in the United States

It might be considered that the five year program of the U.S. Reclamation Bureau to erect dams to supply over two million horse-power was completed this year, although only half of the possible turbine capacity has been installed. Army engineer river control work continues, although on a reduced scale, and plans are underway for spending one-quarter of a billion dollars for an additional series of locks in the Panama Canal.

Nickel alloys continue to do their part in this important work, valve stems and valve trim of "MONEL" having been extensively installed both by the Reclamation Bureau and the Army Engineers. In two new flood control projects in Mississippi, nickel steel has been ordered for the gate operating machinery and a nickel alloy will probably be used for the conduit liners. Stainless clad steel has proved satisfactory for this work at Tionesta and Cripple Creek. In one of the older river locks the cylindrical type valves are being renewed, and seats, bolts and nuts of "MONEL" are being substituted, as the bronze formerly used did not live up to expectations.

Nickel steels and irons have been generously applied for gate operating equipment. An interesting use of nickel alloys in construction work are the welded pontoons of copper-nickel-molybdenum steel, to support dredge pipe for bottom soil removal.

\*Trade-mark of the International Nickel Company.



## Nickel in Steam and Electric Power Equipment

International developments in 1939 have focused the attention of governments and industry on power plants. In order to supply the additional power requirements, more power plants were erected in this last year than in any other of the past eight years. In these plants it is possible to obtain lower power costs because of recent advances in power plant design. Many industrial plants have added their own power plants, operating at temperatures above 800°F. and at pressures as high as 1,350 pounds.

The speed at which coal is burned has necessitated increased use of soot blowing equipment and, with it, strong heat resistant alloys. Silicon hardened "MONEL" casting, "INCONEL" and rolled "MONEL" are all giving service in the high temperature parts as are three-half per cent nickel steels in the operating worms. The use of "K" "MONEL" has increased for pump rods and the adoption of regular "MONEL" has extended to the handling of plain water because of the saving in packing costs. Likewise, "MONEL" and special copper-nickels are being found economical for the stems and seats of many brass valves handling water in the power plants.

A British manufacturer has adopted nickel-molybdenum steels for generator rotors. High steam pressures and welded systems of piping have brought in the use of expansion joints and metal bellows made to-day in stainless steel, nickel and "MONEL." It is standard British practice to use for the valve faces at high pressures and superheats castings of either silicon "MONEL" or a bronze containing about 50 per cent nickel.

A Swiss engineering firm has recently adopted a bronze containing approximately two per cent nickel for turbine runners because of its resistance to cavitation. Power plants are finding it economical to adopt the navy practice of refining their lubricating oils in high speed centrifuges, and "MONEL" high tensile forgings have become standard with some centrifuge manufacturers in Great Britain and the United States.

## Nickel in the Electrical Field

Precise photographic exposure meters, speedometers, electrical, torque and flow meters, as well as watt meters and other electrical instruments now employ Alnico permanent magnets. These nickel alloy magnets are also entering into larger electrical equipment including blowouts and magnetic latches for contactors, motors which will "back off" when overloaded, and in numerous small devices.

In contrast are the magnetically soft nickel-iron alloys used for the cores of high quality audio frequency transformers, loading coils for long distance telephony, magnetic shields, and for accurate current transformers.

Television makes use of nickel not only in the Iconoscope (the eye) but in the numerous amplifier tubes and in the cathode ray tube which "paints" the picture at the receiver. Pure nickel is still used in large quantities for internal parts of radio tubes.

Special nickel-iron alloys continue to meet individual industrial requirements for low thermal expansion, or for retention of stiffness when heated.

Motor slip rings made of copper hardened with a few per cent of nickel have found considerable use in England, while "MONEL" has proved very suitable for slip rings in devices which operate infrequently, and which must not corrode or develop high resistance while idle.

Fluorescent tube lights show promise of revolutionizing the lighting industry. Nickel electrodes are widely used in these lamps as well as in signs, and are now being produced at low cost by highly specialized equipment.

Nickel alloys are standard in automobile spark plugs while "MONEL" is preferred for high tension distributor parts which must withstand arcing and corrosion. Numerous operating and contact springs are made of "MONEL," "K" "MONEL" and the new heat treatable nickel alloy, "Z" nickel.

During the year two new developments in nickel-iron-alkaline storage batteries were announced in the United States.

One was the development of an improved model of electric cap lamp which affords increased illumination and lighter weight. Electric cap lamps are rapidly replacing open flame lamps in both coal and metal mines.

A second development consists of a type of cell which affords approximately one-third more power and capacity in proportion to the horizontal dimensions than previously available in nickel-iron-alkaline batteries. The new cell meets a demand for batteries for use where horizontal space is at premium, such as heavy-duty industrial trucks, trucks operating 24 hours daily or trucks used for carloading and restricted to narrow clearances and short turns.

The general outlook for heavy-duty industrial storage batteries continues favorable. Air conditioning of steam railroad passenger cars continues to result in the application of larger batteries. Industrial trucks now going into service average much larger batteries than formerly. Popularity of Diesel power in new marine construction is resulting in larger marine electrical systems and correspondingly larger batteries. The Drumm type of accumulator, a form of the nickel-alkaline battery, is being used on one branch of the Great Southern Railway of Ireland, for the operation of all normal passenger traffic.

## Nickel in the Tool Industries

Replacement of obsolete equipment and expansion of plant facilities combined to make 1939 one of the best years in history for the machine tool industry. England and the United States, the largest machine tool producing countries, both felt the effect of this. New production processes—such as in aviation—and the constant desire for more speed were factors affecting the design.

Materials of construction played no small part in this high production. A recent survey covering 96 of the outstanding machine tool plants indicates that 75 per cent of these employ nickel cast irons for major components. The tonnage of nickel consumed in cast iron by the industry during 1939 showed a material increase over 1938.

In Great Britain, where the machine tool industry was exceptionally busy during the year, extensive use of nickel alloy steels was made both for gears and for other highly stressed components. Nickel-molybdenum steel usage in hand tools in the United States continued to increase considerably. French tool makers are showing a growing interest in nickel irons and the rapidly growing Italian machine tool industry is consuming more nickel.

## Nickel in War Times

The first important use of nickel steel was for armor plate, soon followed by its use in guns and armor piercing projectiles. It is, therefore, not surprising that under present circumstances there is wide interest in the use of nickel in armaments and the broader question of the increased use of nickel in wartime. The latter is of the greater importance to the nickel industry. Under war conditions the tempo of industry is accelerated temporarily because of the increased consumption of all products from wheat to motor-cars. As nickel is a metal of wide industrial use, particularly in the heavy industries, either for their own consumption or resale, any acceleration of production naturally increases consumption of nickel. More closely related to active war operations is the development of mechanical equipment for the movement of troops. This has increased the need for alloy steels and cast irons, and has resulted in a wider use of nickel.

Nickel is used in alloy steels for guns and for armor piercing projectiles which must have high shock resistance. Nickel alloys are also used for operating mechanisms as well as parts of motive power and servicing equipment on shipboard. By far the largest use of nickel in this category is in the defense forms of armament, such as armor plate and gun shields. For armor plate a special nickel steel has been adopted which is amenable to case hardening and maintaining at the same time an internal structure that resists impact. In battleships, thicknesses up to 18-in. are used for protecting the vital parts. The amount of nickel used in small arms—rifles, bayonets, and grenades—is decreasing, and cupro-nickel bullet jackets are now seldom used.

It is estimated that in the year of greatest war preparation (1939) approximately 15 per cent of the world consumption of nickel will be used for armaments.

## Nickel in Food Processing

One of the leading peacetime industries, the food industry, in time of war, assumes an importance second to none. While



itself a producer of the first importance, it is at the same time a large consumer of metals—steel and tin for containers, as well as steel, iron, and brass for processing machinery. In this equipment, to protect the purity of the product, substantial amounts of corrosion resisting nickel alloys are used.

These materials play an important part in the increasingly popular quick freezing processes for the preservation of food-stuffs, including fruits, vegetables, and seafoods. "MONEL," solid nickel, stainless steel, and, to a lesser extent, nickel-clad steel are now being used for freezer pans, containers, conveyors, spray nozzles and piping, salt dissolving tanks, troughs, cabinets, hoppers, guide rails, accessories, and other machinery parts.

From brew kettle to dispenser, for most all equipment for the manufacture and handling of beer, corrosion-resistant nickel alloy materials have demonstrated their superior suitability and economy. Many brewers are now shipping their product in stainless steel beer barrels. Nickel, nickel-clad steel, and "MONEL" were widely used in the recent modernization of a well-known Canadian brewery.

The most widely used nickel alloy in the dairy and milk products industry is the 18-8 chromium-nickel stainless steel. To-day, there is hardly a piece of dairy plant equipment which is not available in stainless steel construction.

One of the largest firms of bakery engineers in the United Kingdom has standardized on "MONEL" for equipment coming in contact with yeast and brine. Large tonnages of "NI-RESIST" continue to be used in the United States, in fish canning machinery and dough mixing equipment.

### Nickel in the Building Industry

Various "World Fairs" emphasized uses of new techniques and materials in building design. They exemplified the employment of white metal in connection with cut, baked, or formed materials of various colors and textures, or in combination with yellow and brown metals. The new functional and decorative characteristics of glass are made effective by strong white alloys

of nickel, with nickel contents ranging from 67 per cent ("MONEL") through 30 per cent to 18 per cent (nickel silvers) to eight per cent (stainless steels). The gates of the British Pavilion at the New York World's Fair were constructed of 20 per cent nickel silver extruded sections, a combination recently available. Nickel silver architectural trim is also being used for the Railroad Retirement Board Building and the Social Security Administration Building at Washington, D.C. The new Airlines Building in New York will use large quantities of stainless steel for exterior, entrance, and waiting room trim.

More truly structural, are "MONEL" tie wire and hanger rods, for large suspended ceilings, and "MONEL" sheet for roofing, flashing, gutters, etc. The buildings in the United States in which "MONEL" was used for these purposes in 1939 included Mellon's National Gallery of Art, at Washington, D.C., and other galleries and museums on the Eastern seaboard. Combining decorative and useful characteristics, are the many applications of "MONEL" and stainless steel for kitchen and pantry working surfaces. Laundry and hospital equipment grows old slowly, usefully and attractively. "MONEL" pump rods and water tanks serve unseen.

### Nickel in Household Equipment

Though 1939 has not been a year of widespread house building, the household uses of white metals have increased appreciably.

The use of "MONEL" in tanks for gas and electric water heaters and of both "MONEL" and stainless steel in the form of sinks, range tops, and working surfaces continues to expand.

Nickel alloys with 80 per cent and 60 per cent nickel are still standard for electric heater elements and with 36 per cent nickel for temperature controls. Stainless steel with eight per cent nickel has been sold extensively for cooking utensils.

The consumption of pure nickel as a base material for gold filled jewelry and eye glass frames has increased considerably during the past year. Extensive quantities of copper-nickel-zinc alloy were used as the base material for silver plated tableware.

# Engineering Standards in China

By A. J. PERCIVAL, M.I.E.E.

(A scholarly address on Engineering Standards in China was given before the Engineering Society of China by the President of the Society, Mr. A. J. Percival, M.I.E.E., at a meeting held at the Henry Lester Institute of Medical Research on January 22. The speaker stressed that, in the work of reconstruction following the war, China would need dependable guides to aid her in judging standards of quality, and he also voiced the hope of engineers that China would take the earliest opportunity to modernize and strengthen her patent laws. The text of his address follows):

\* \* \*

TODAY China stands almost on the threshold of a new era in which it will become increasingly necessary, particularly in engineering, to define quality by means of Standards and Specifications.

Before the war with Japan, China was producing engineers, scholars and administrators who were ardently coming forward as never before to take their place in the service of the nation, and it is remarkable that throughout the hostilities they have been boldly planning new schemes of education.

China will work out her own salvation after the dislocation of the war and will gradually industrialize while at the same time she will restore her ruined communications and other public engineering services. In this tremendous task she will need dependable guides to aid her in adjudicating standards of quality, and she will eventually evolve her own National Engineering Standards. It is therefore opportune to review this important subject which vitally affects engineering in all its branches.

Some people detest the very word "standardization,"—probably because they think it will interfere with their freedom of action and choice or even that it may retard progress. In fact, standardization properly carried out and wisely controlled, relegates

the problems which have already been solved, to their proper place—the field of routine—leaving the creative faculties of the engineer free to tackle problems still unsolved. Standardization thus becomes the tool of progress, its servant and not its master.

### Technical Developments

The flood of technical developments in recent years has made it more and more difficult to accurately assess the value of any material or product by personal inspection. In consequence, quality can only be truly assessed by suitable methods of expressing certain criteria and properties of the material and by providing adequate methods of test. These are the basic functions of the standardization movement which has become almost worldwide in recent years.

Incidentally, the origin of the word "sincerity," which is so popular nowadays in Japan, may be said to be the lack of engineering standards in ancient Rome. There it became the practice of sculptors to conceal surface cracks in a statue with the aid of melted beeswax. Soon the beeswax would dry out and expose the cracks, and to such alarming proportions did this practice of wax trickery grow, it finally became the custom of reputable sculptors to guarantee their works as *Sine Cera*—literally translated "without wax." So we owe the English word "sincere" to this early Roman standards guarantee.

Here in China where "can pass" is still the order of the day, the principal questions which arise are,—who is to prepare these Standards and on what general principles are they to be laid down? The first of these questions may be said to be already answered.



It will be a government department such as the National Bureau of Standards which was formed about seven years ago by the National Ministry of Industries at Nanking and which had done much excellent work prior to the outbreak of hostilities. Admittedly it is contrary to the practice of the leading industrial nations to have their industrial Standards initiated and determined by a government department. Such Standards should be the product of the meeting of minds representative of all the conflicting interests concerned and out of which a genuine consensus of agreement is reached. However circumstances in China are such that it is unlikely that any suitable non-government organization for this important function will come into existence in the next decade. Therefore, as engineers, we can only co-operate with the government and do our best to ensure that they will adopt the attitude that in this work their primary aim is to secure sound engineering Standards. In doing this they should impartially adjudicate between the competing interests of the user and the producer. Individualism and reluctance to co-operate are said to have always been Chinese characteristics. If this is true we hope they will remember that the rugged individualist of to-day is very apt to become the ragged individualist of to-morrow.

### Purchasing Power

Standards are ruled to a very considerable extent by purchasing power. In China this is lower than in any other country in the world. In consequence the habit of buying on price is perhaps more deeply ingrained than elsewhere. Price, however, is rarely a criterion of value. Certainly it is unwise to pay too much but it is unquestionably worse to pay too little. When too much is paid it is generally only a little money that is lost but when too little is paid it is often the case that efficiency has not been given proper consideration. Even everything may be lost because the thing bought is incapable of doing what it was bought to do. If the lowest price is accepted it is well to add something for the risk incurred and so doing may bring the price up to that of the quality article.

The final purchasing of engineering plant and materials here is generally decided by people who are not engineers. They may perhaps ask the engineer whether the offers are in accordance with the enquiry and specifications—if any. In the absence of specified standards there are bound to be many loopholes and in such circumstances, although the engineer's "face" may be saved, much else is probably lost through lack of these safeguards.

The safety of the public should be the first concern of authors of Standards Specifications. This is patently essential in deciding such Standards as those of strength of steel used in bridges, buildings, cranes, ropes and boilers, and in many electrical specifications. The Shanghai Municipal Council has done excellent pioneering work in this direction under most difficult conditions.

It is of great importance that where standards are laid down, reasonable tolerances should be allowed. Where penalties are stipulated for failure to meet guarantees, in equity—*pro rata* bonuses should be offered for improving on them. The majority of Standard Specifications have to deal with the quality or the performance of materials, machinery and apparatus. These should be subject to frequent periodic review and revision to keep them abreast with progress. They must not be allowed to get into a rut. It is a truism that a rut differs from a grave only in being longer. Many specifications are primarily dimensional so as to secure interchangeability or to ensure adequate robustness and to reduce economic losses occasioned by multiplicity of stocks and patterns.

### Compiling Standards

China will continue to make use of the experience of other nations in compiling her Standards. Many people still have the mistaken idea that imitation is a sure sign of weakness. On the contrary it is foolish and weak not to take the utmost advantage of past experience. The weakness lies in the fact that imitations are usually very inferior to the originals, particularly in engineering products in China where it is still very difficult to obtain materials having the special and essential mechanical, thermal and electrical characteristics inherent in quality engineering products to-day. Moreover high precision production machines capable of turning out components to modern precision standards are almost non-existent here, as yet. Those are but two of the reasons why we hope the Chinese government will take the earliest opportunity to

modernize and strengthen her Patent laws. As an example of this crying need I would mention that I recently had occasion to send to England—for testing—what appeared at first glance to be an exact imitation of a piece of imported apparatus which is in common use here. This imitation is made in large quantities in Shanghai and even the casting numbers are faithfully reproduced. The routine tests through which it was put in England revealed among other weaknesses that the fuse blocks were made of hygroscopic and inflammable material. This constituted a definite fire risk and is therefore a hidden source of danger which would be avoided if proper Standards could be enforced there in place of the jungle rule which is now the order of the day.

The trend everywhere has been towards international standards agreements. No less than twenty countries have standardizing bodies, but the majority of them have been endeavoring to reach agreement under the aegis of the International Standards Association whose headquarters are at Basle in Switzerland. The electrical industries have been pioneers in this direction. Since 1906 there has been in operation an International Electro-technical Commission. One outcome of its work has been that purchasers of electrical machinery were, before the European war, to an increasing extent asking that tenders should be based on what are known as "I.E.C. Recommendations" rather than accept standards of Britain or Germany or America.

The British Standards Association had its inception 39 years ago and now comprises more than a thousand committees who have issued about 800 Standard Specifications and Reports. Over a quarter of a million of these are sold and distributed annually.

Although standardization has been going on for many years past in all the great industrial organizations in America it is only in recent years that it has become the national movement known as the American Standards Association. The Bureau of Standards of Washington has been immensely successful in this line of progress to the great advantage of the United States. Incidentally, in the course of the preparation of a standard specification for household refrigerators, tests established that the ice wasted in an ordinary refrigerator might be twice as great as in the best refrigerator and not necessarily the most expensive one! The resultant relative spoilage of food was even more pronounced.

One of the aims of the long term research which the Foundations Research Committee of the Engineering Society of China is undertaking is to recommend standards of good practice for foundations here. The name of this Society, as set out in Chinese characters, is the International Engineering Society of China. As such we shall always be delighted to co-operate with whatever Standards authority is constituted in this country and we look forward to the day when she will take the honored place in the engineering world to which her great intrinsic qualities entitle her.

### Progress in Chekiang

A Chinese writer reports that notwithstanding the fact that its capital, Hangchow, and a large portion of territory have fallen into Japanese hands, Chekiang is moving ahead in every field.

Rapid economic development is particularly noticeable in the province. Within the short space of two years, seven large factories and 100 others of a smaller scale have been established in areas remaining in Chinese hands.

Under Government auspices, three model industrial areas have been demarcated. In the first area, each factory has 30 workers. They produce 34 pounds of alcohol (98 per cent) and 22 pounds of alcohol (85 per cent), 1,100 candles, 30 catties of yeast powder and 150 catties of noodles, daily.

In the second area, factories have been devoted to the weaving and spinning. Each factory employs 300 workers. They produce 977 pieces of cotton cloths, 5,728 pounds of cotton yarn, 7,286 pounds of absorbent cotton and 228 pieces of gauze.

Paper making is the chief trade in the third industrial model area; while ink and stationery are the by-products. The paper mill has 1,000 experienced hands.

The factories which were removed from the coastal cities are now the pioneers of the young industries in the western and southern parts of Chekiang. In Wenchow alone, it is stated, more than 60 new factories are now operating at top speed. In the interior of Chekiang, there are 15 ironworks, seven dyestuff manufacturing factories, 17 timber mills and ten printing houses.



# Progress of the Fast Diesel-Powered Railcar

## German State Railways Enlarge System with Addition of Fourteen Three-Coach Units Powered with Maybach Supercharged Diesel Engines

RECENT years have witnessed immense progress in rail transportation in the form of increased speeds, greater comfort, modernized forms, with ever new improvements and betterments. The student who would acquaint himself with the progressive steps in the development of the fast railcar must examine the achievements in this field of German engineers, and learn the practical values that have been realized on the German State Railways on which the latest innovation has been the new three-coach fast railcars equipped with supercharged Maybach railcar Diesel engines of the "GO6" type. The use of high speed Diesel engines with bogie mounting of the entire power set has met with notable success on both main and secondary lines of this great railway system.

Economic considerations have been a major factor in the introduction of the fast railcar on the German State Railways and on other railway systems. The first powered railcars had the same driving equipment as lorries and automobile trucks with ordinary lorry petrol engines and simple mechanical gear boxes. The engine power was just sufficient to maintain the speed of ordinary steam trains, and owing to this, these first railcars could be used economically only on secondary lines on which traffic requirements were not severe.

Through the years of general traffic depression, and earlier, it was foreseen that the railcar was best suited to meet changed economic requirements in reviving railway traffic, an object to be attained only by improving comfort facilities for passengers, and in accelerating speed so as to reduce travelling time. This marked a second stage in the development of the railcar, and it emphasized the importance of the railcar in railway traffic. It was then realized that entirely novel power equipment would have to be evolved because the power equipment employed up to that time no longer was adequate for the increased requirements of railway service. The first great change at this time, therefore, was from the petrol engine to the thermally more efficient Diesel engine with its greater output. Because of weight and space the slow-speed Diesel engine of that day was inadequate for the purpose sought, and to approach a solution of the problem it became necessary to develop a high-speed Diesel engine specifically designed for railcar service. The railcar has attained the eminence it now occupies in the railway traffic of many countries solely as the outcome of the creation of a reliable high-speed railcar Diesel engine, and this has been an important factor also in the acceleration and improvement of steam and electric trains.

### Early Trials Disappointing

The first trials of railcars on the German State Railways in the early years of the century gave but slight promise of the future usefulness of the railcar, and the Administration of the German railways was encouraged to continue experiments with railcars only by the development of the Diesel engine. At the Seddin Railway Exhibition, which was held in 1924, an eight-wheeled vehicle was exhibited among other railcars.

This had been built by the Waggonfabrik Wismar and Maybach-Motorenbau and it attracted special attention because it was equipped with the first high-speed railcar Diesel engine of 150 horse-power and had been designed specifically for railcars.

Not only the Diesel engine, but also the four-speed mechanical Maybach gear-box of this vehicle, had been evolved for railway needs. This early railcar is outstanding because in it for the first time the fundamental essentials of railcar construction were realized, opening new ways to the future development of Diesel railcars. These fundamental essentials may be summarized as follows:—

- (1) Use of high-speed Diesel engines specifically designed for railway traffic.
- (2) Use of transmissions also specifically designed for railcar service.
- (3) Bogie-mounting of the engine plant in the eight-wheeled vehicle with all the obvious advantages such as accessibility of parts, excellent noise muffling, advantageous use of available space, reduction of overhaul periods through use of spare bogies, and otherwise.
- (4) Use of single engine sets instead of twin engine sets wherever requisite power set can be mounted on one bogie.
- (5) Development of the railcar power set with all accessories, controls and safety appliances—without direct personal supervision, but with control and supervision placed in the remote driving cabs, ensuring operation of engine plant from each driving position as well as multiple unit control.

The development of the railcar was marked by the production of many diverse trial vehicles differing in nearly all their parts. The engineers of the German State Railways early recognized that the essential new element in the Diesel railcar was that the railcar supplied its own source of power. The task that confronted them was to create the requisite engine plant, of a type unknown before that time, which would be suitable for railcars. In the evolution of the vehicle the number of railcar types was limited to a necessary minimum, but consistently the fundamental essentials, as set forth above under 1 to 5, were kept in mind, so that engines, transmissions, accessories, and in short, "the railcar power set" was developed. In consequence, the evolution of the vehicle in Germany took its rise from the engine plant. The success attained later by the German State Railways can be attributed to a large measure to the fidelity with which this procedure was followed. After building a suitable engine plant it was then easier to proceed with adequate

coach body designs and produce new forms adapted to railcar needs. This led to the construction of wholly novel vehicles in the course of the years and in these all component parts from the engine to the last detail of the coach were inter-related in highly efficient unity. This unity was achieved by conforming with a sequence of operations beginning with the power plant and leading to the creation of standard designs to conform with operation and output of the power plant, since it was recognized that the reliability and economy of railcar service

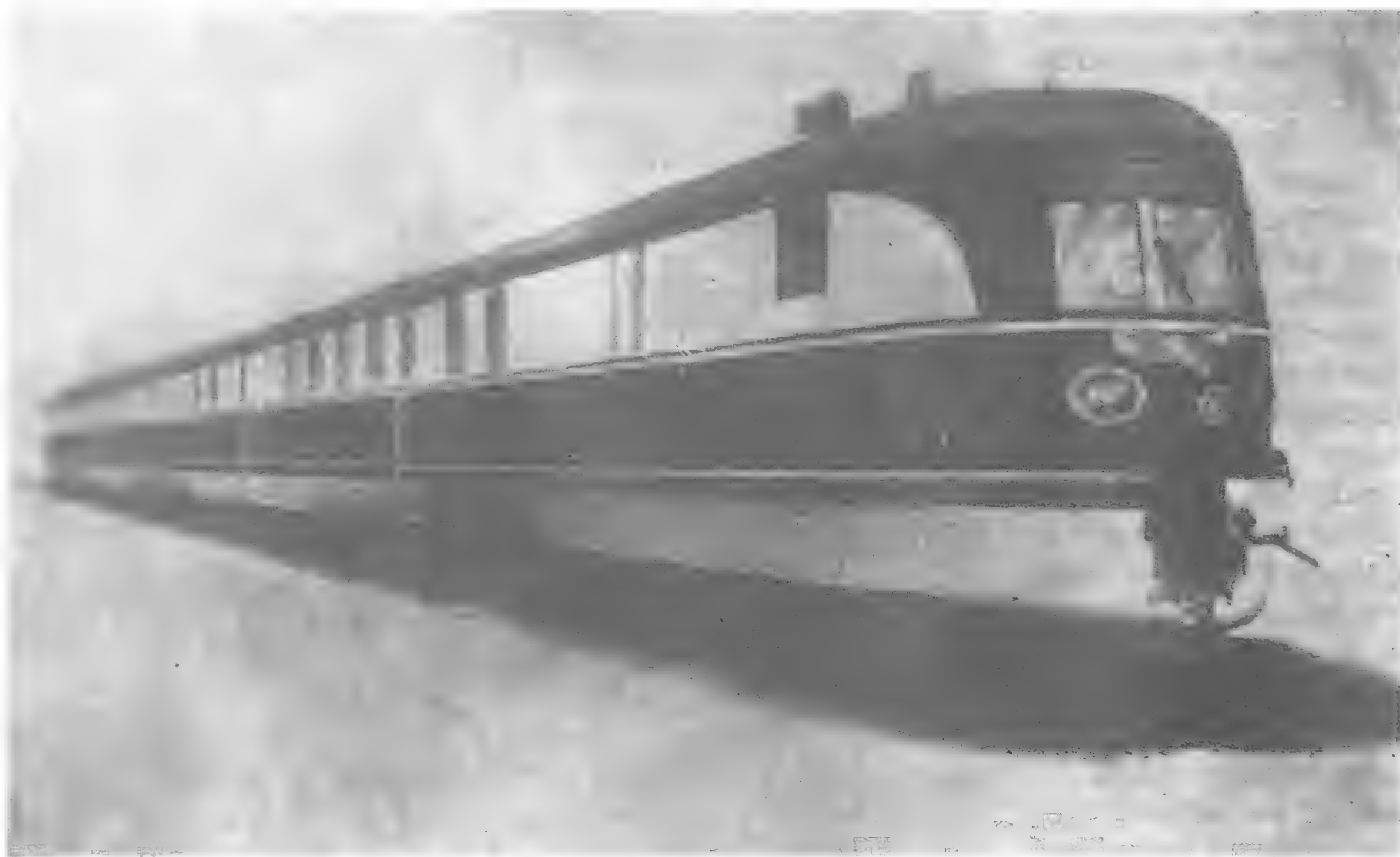


Fig. 1.—Three coach Diesel-electric fast railcar of the German State Railways, type "Köln"



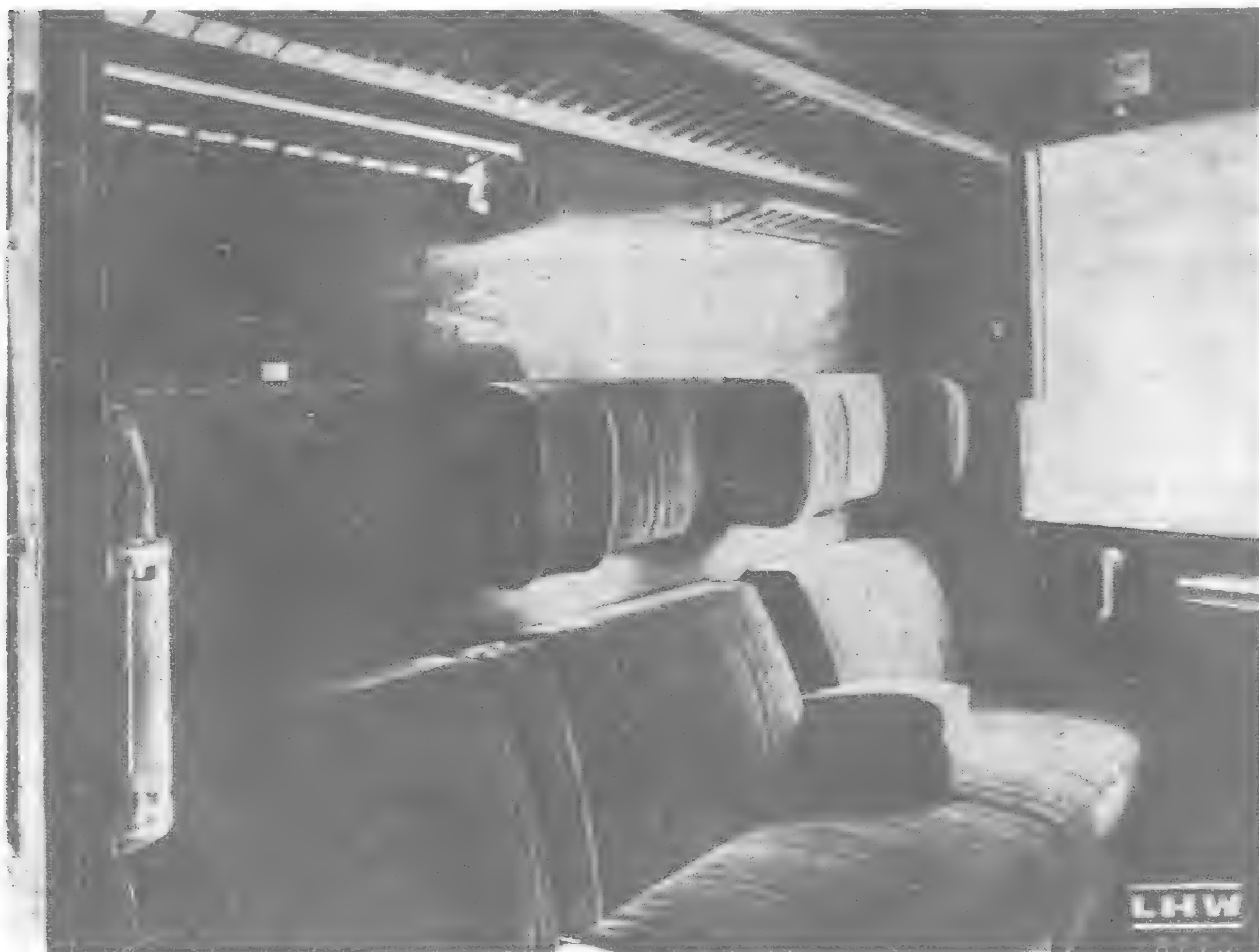


Fig. 2.—Interior view of passenger compartment of the three-coach fast railcar, type "Köln" on German State Railways

depended primarily upon the power set. Advances were achieved only as result of years of experience with railcars in practical service.

### The Maybach Diesel Engine

From the beginning in supplying equipment for the German State Railways Messrs. Maybach-Motorenbau G.m.b.H. at Friedrichshafen followed energetically the developments of the Diesel powered railcar. Logically, most of these standard types of the Reichsbahn railcars were built in the Maybach Works. The products of these Works have also met with a large measure of approval in countries outside of Germany.

The success achieved with the fast railcar service for general traffic over the German State Railways led the Administration to acquire fourteen additional three-coach fast railcars besides the two-and-three coach railcars making it possible greatly to enlarge the fast railcar system. These fast new railcars, which were put into service in 1938, are all equipped with Maybach Railcar Diesel engines so that essentially the Maybach Diesel engines have been adopted for all the fast railcars in the service of the German State Railways. From experience gained from the two-and-three coach fast railcars of various types it proved to be desirable to provide increased seating accommodations, and enhanced comfort facilities for passengers. In consequence, the new trains had to be bigger and heavier, and, of course, acquired a greater engine output. Also based on the experience gained from the earlier fast railcar types the three coach railcars of the "Köln" type were powered with a total of 1,200 h.p. This total engine output of a single railcar unit was divided into two engine groups, each installed in one end bogie. This arrangement has been applied to nearly all multi-coach railcars and has proved excellent in service.

The increased seating capacity of the new fast railcars was achieved by composing the three-coach railcar unit of three separate cars with separate bogies. Moreover this design made possible a universal use of railcar trains in that, if required, the central car can be eliminated or a second central car may easily be added. In order to give the passenger the comfort he enjoys in the big express train the new fast railcars have been equipped with separate compartments

of great width and also a spacious dining compartment is at the passenger's disposal.

As driving engine, the well established Maybach 12-cylinder Diesel engine type pressure-charged on the Brown-Boveri-Buchi system was chosen, developing an output of 600-650 h.p. at 1,400 r.p.m. Some time ago the fast railcars of the "Leipzig" type on the German State Railways were equipped with this engine. Four of these railcars, each powered by two Diesel engines were placed in service in 1935. The supercharged engines differ on the whole from the non-supercharged 410-450 h.p. engine by the alterations needed for mounting the supercharged. However, the supercharged engine has no larger plant than the 410-450 h.p. engine, and therefore it can be installed in a four wheel bogie together with its generator or the hydraulic or mechanic transmission. It was possible therefore to retain for the new three coach fast railcars the general arrangement of engine plant that has proved successful with so many railcar types in Germany and in other countries.

### Installation Details

A Diesel engine with its respective main generator is installed in each end bogie of the railcar unit. With regard to the factor of weight the supercharged engine enjoys special advantages for whereas the 410-450 h.p. engine has a weight of about 2,100 kgs. (2.1 tons) the supercharged 600-650 h.p. engine weighs but approximately 2,300 kgs. (2.3 tons), although the engine output of the latter is about 50 per cent higher. It is to be added also that this 600-650 h.p. engine, in spite of its greater output at equal cylinder capacity and lower weight per h.p., is not exposed to any greater stresses than the non-supercharged 410-450 h.p. engine, owing to its special type of supercharging.

To go into some details regarding "supercharging" it may be said that the method of improving the output of Diesel engines in this way is being applied in increasing measure, especially in four-stroke Diesel engines. Amongst supercharging systems developed in the course of years the Buchi method with BBC exhaust gas turbo blower is most widespread, especially where the effort is to increase output by more than 30 per cent. As is known, the normal four-stroke Diesel engine sucks its combustion air from the surrounding air during the suction stroke. In this system the



Fig. 3.—Dining compartment of three-coach fast railcar, type "Köln"



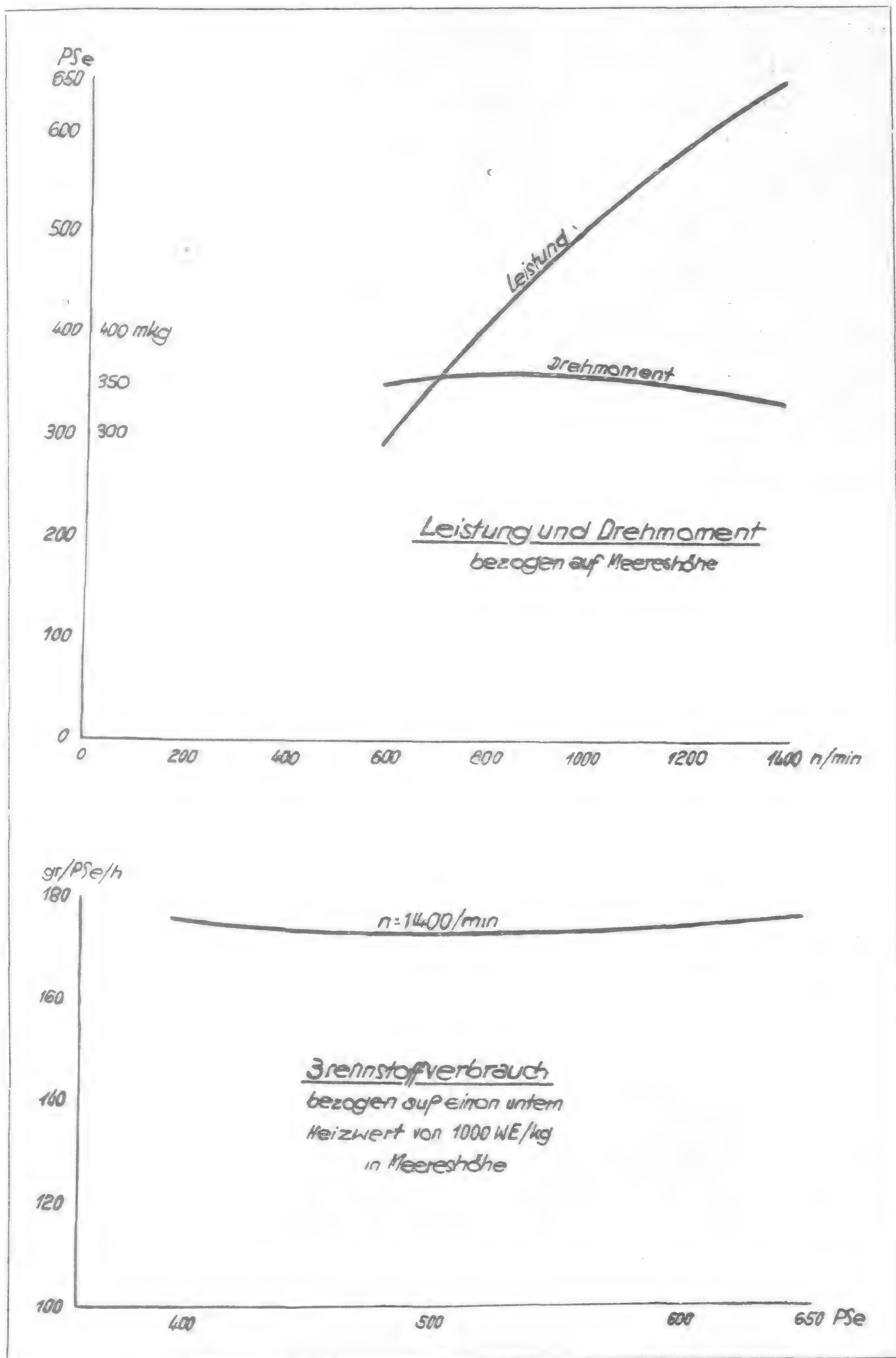


Fig. 4.—Output, torque and fuel consumption curve of the 12-cylinder Maybach Diesel engine "GO6" type, 650 h.p. at 1,400 r.p.m. As installed on three-coach fast railcars on German State Railways



weight of combustion air available at the end of the suction stroke is reduced first by a residue of exhaust gases left in the cylinder from the preceding cycle of action, secondly, by the increase of temperature of the air drawn in, caused by the mixture with exhaust gas residue and radiation heat from the cylinder, and finally, by the throttling and friction resistance in the intake ducts but, if the Diesel engine is fed with pre-compressed air, that is, the Diesel engine is *supercharged*, the effect is manifold comprising:—

- (a) increase of the available combustion air weight
- (b) scavenging of the exhaust gas residue of the compression chamber
- (c) cooling of all parts of the combustion chamber
- (d) a favorable influence on the combustion process also at fractional load.

In consequence of the increased air weight a larger amount of fuel can be burnt in this way the output of the engine is increased without raising the temperatures or the heat stresses. This is an important feature, for the highest combustion temperature being determined by the surplus air can be kept in the supercharged engine by choosing the same air surplus as for the non-supercharged engine. It appears, too, that the scavenging exerts a most important influence on the degree of output increase so that it must be considered as an essential pre-condition for the supercharging of four-stroke Diesel engines. The Buchi supercharging method exactly consists in producing for scavenging heavy pressure surges in the exhaust gas piping between the engine and the turbine by dividing the exhaust gas pipings and by a special regulation of the distribution timing of the valves. If the scavenging process synchronizes with the dropping of pressure, it is possible to obtain an efficacious scavenging without much air superpressure.

### Stresses Remain Normal

Not only the heat stresses but also the mechanical stresses on crankshaft, piston rods and bearings, are kept in normal limits, for the performance diagram of the supercharged Diesel engine differs only substantially from that of the non-supercharged engine by its bigger width. The term "supercharging" or "increase of output" must not be confused with the idea of "overload." From this it is to be seen that operating on supercharging is rather a normal continuous

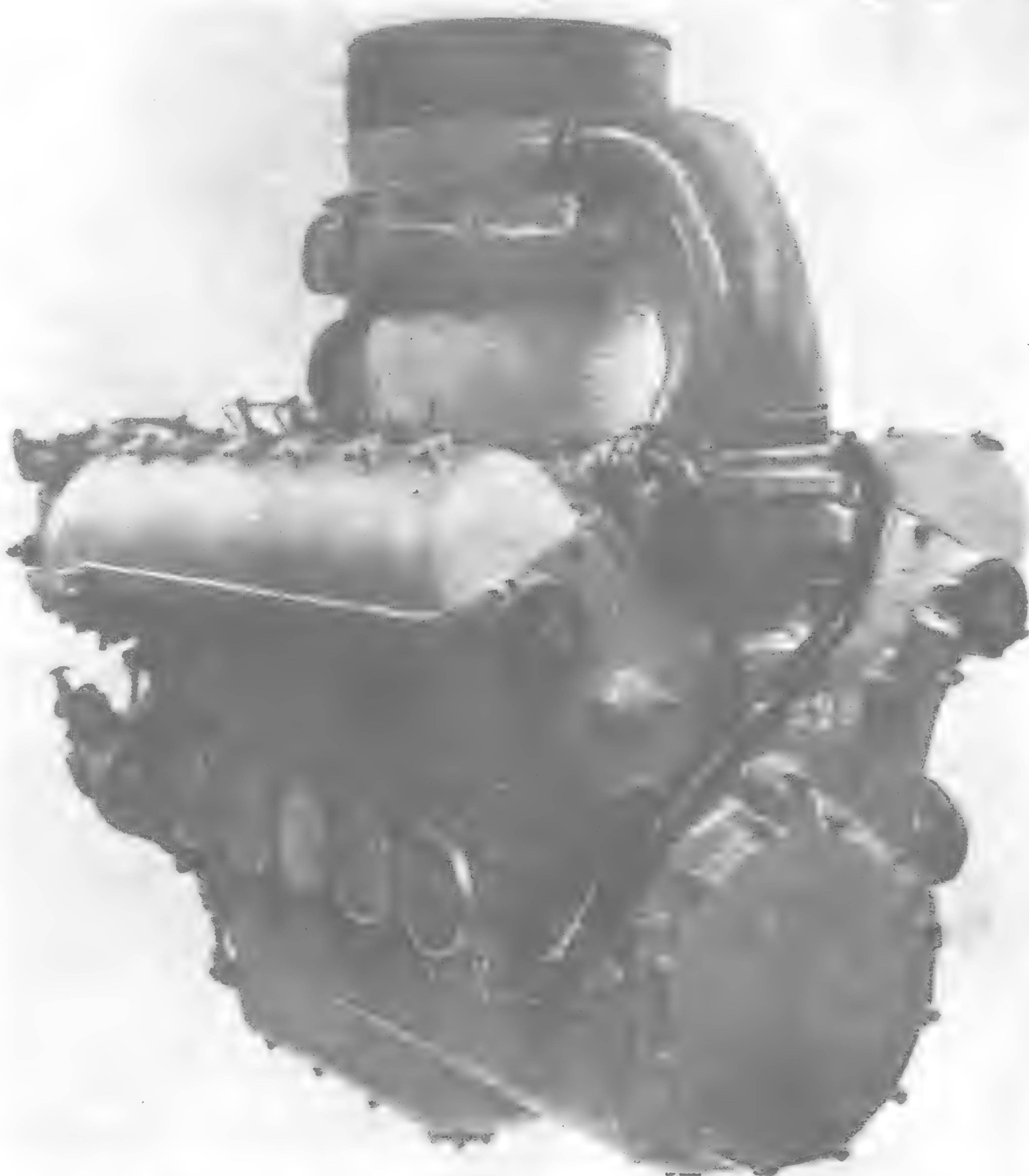


Fig. 5.—Maybach 12-cylinder Diesel engine of the "GO6" type supercharged on the Buchi method by means of BBC turbo blower (600/650 h.p.)

stowing the exhaust gases of the Diesel engine in spacious exhaust piping. For the *pressure surges method*, however, the energy still existent in the *highly tensioned combustion gases* when opening the outlet valve, is utilized. It is evident that when supercharging on the pressure surges method the considerably higher super-pressure of the gases ensures also a larger increase of output in comparison with the constant pressure method. The larger the space into which the gases are exhausting after the exhaust valve has been opened, the more energy is lost. Consequently, it is important when adopting the pressure surges method, to embody an exhaust piping as short as possible between the engine and the exhaust gas turbine. These exhaust pipings must be divided to correspond with the ignition sequence in such a manner that the

scavenging process of one cylinder is not disturbed by the exhaust surge of another cylinder.

The exhaust gas turbine and the turbo blower of the BBC supercharging group are mounted on a common shaft forming an engine unit which is placed by means of a vertical axle right in the middle between the two cylinder rows of the 12-cylinder engine. This arrangement of the supercharged aggregate meets all requirements for an efficient realization of the pressure surges method. There is no additional external motor or any

(Continued on page 82)

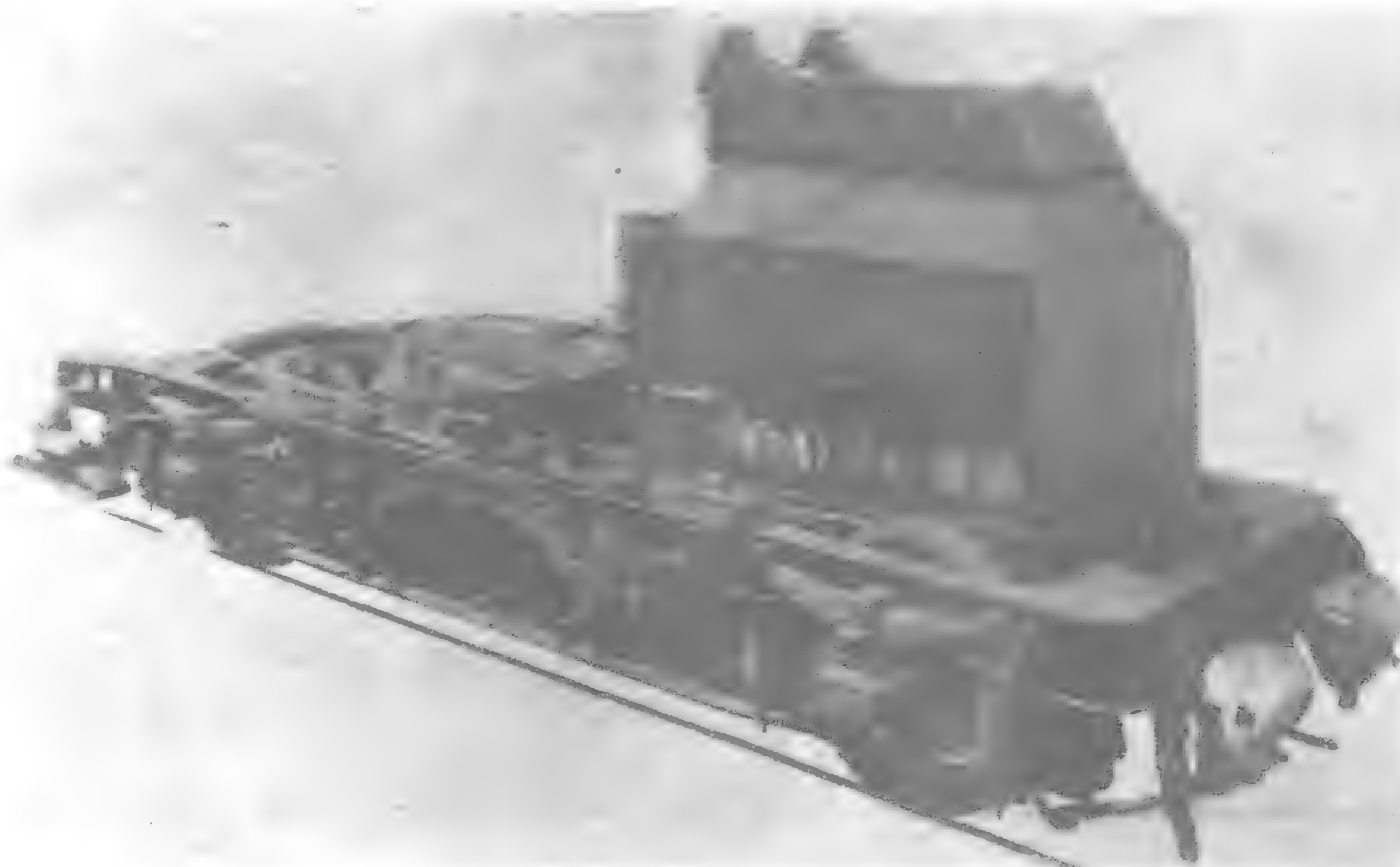


Fig. 6.—Power bogie of the three-coach Diesel-electric fast railcar of the "Köln" type on German State Railways with Maybach railcar Diesel engine 600/650 h.p. supercharged



# Railways in the Netherlands Indies

By J. F. F. GOTZ in *The Bulletin of The Colonial Institute of Amsterdam*

THE problem of transportation in the Netherlands East Indies dates back as far as 1840. It was notably the ever expanding government-owned agricultural enterprises brought under the government culture system of those times that caused the need of reliable means of transport to take on the aspect of an emergency. The main point at issue was how to move the coffee produced on the government coffee estates, which were chiefly located in the central part of the Island of Java, to wit, in that portion known as the "Vorstenlanden," the "Principalities" (Djokjakarta and Soerakarta),\* and the Residency of Kedoe. This product had to be taken to Semarang, a port on the North coast of Java, and so far this had been done very simply by means of buffalo carts. But now the stock of these animals appeared to be quite inadequate to meet an ever-increasing need of means of transport, with the result that sometimes the ships in the roads at Semarang were obliged to wait for months before their cargo reached them, while the coffee itself grew mouldy in the godowns in the interior. Though there are plenty of rivers in Java they are for the most part not suitable as waterways, being very largely steep mountain streams with a very variable depth. When a permanent and adequate solution of the problem was discussed it was only natural that railways should suggest themselves, for this was the age when transport by rail was coming to the fore.

Nor was private initiative idle in this field and in 1841 the first application was made for a concession to build and run a railway line from Semarang to Kedoe and the "Vorstenlanden." The idea was still to use oxen, buffaloes and horses for traction; the capital investment was calculated at 5,000,000 guilders and the Government was requested to guarantee that shareholders should receive a minimum dividend of five per cent on their investment. This latter request was the principal reason why the application was refused. The rebuff did not kill the idea of railway construction, however; a number of other applications for concessions were made. Then the advisability of Government railways was broached and the resulting discussions led to a conflict between those pro and those anti government construction and exploitation of railways, without any solution of the problem being arrived at.

Not until 1863 was the first concession granted, the successful applicant transferring his rights to the *Nederlandsch Indische Spoorwegmaatschappij*, or Netherlands Indies Railway Company. The concession included the above-named areas, namely, the Principalities and the Kedoe Residency, and a little later it was extended by the construction of a line from Buitenzorg (the residence of the Governor-General) to Batavia (the capital of the Netherlands Indies).

At first the construction of the line (with a gauge of 1.435 meters) proceeded with great dispatch, but there were financial difficulties, so that the first track completed—from Soerakarta (Solo) to Djokjakarta (Djokja)—was not opened for public use until July 10, 1872. The rest of the line was built in due course, but at the urgent request of the Government the gauge between Buitenzorg and Batavia was changed to 1.067 m, and this is the width which later came to be adopted all over the Indies.†

After the first steps in the field of railway construction in the Indies had been taken, more comprehensive plans were continually being made—plans which were based on the idea of the development of the Island of Java, while considerations of defense also played a rôle therein. A general railway system for Java was drafted, without any very great attention being given to the question of whether it would pay or not. Applications for this concession were called for, but with the proviso that the latter must include the whole project as planned, which involved a main road extending over the entire length of the island with here and there a side-line branching off from it. Considering that the profit the various lines were likely to yield was estimated at figures ranging between 0.25 per cent and a maximum of four per cent it was small wonder that private investors were not inclined to respond to the

offer without a high guarantee of interest being given by the Government. The result of all this was that finally the Government undertook the construction and management of the railways. This resolution of the Netherlands Government was passed on April 6, 1875.

The first track laid by the government was that between Soerabaya and Pasoeroean—in the eastern part of the island. The whole project was now systematically carried forward and a line was constructed from the most easterly point—Banjoewangi, opposite Bali—to the most westerly—Merak, opposite Sumatra.

As stated above the gauge measured 1.067 meters and this width was selected for practical reasons. A large part of the projected lines passes through very mountainous country, and it was estimated that, for technical reasons into which we will not enter here, the narrower gauge, while perfectly adequate for a proper development of the railway, would mean a quite considerable saving in costs of construction.

Practical experience has shown that this choice was a fortunate one; it saved a great deal of expense, while this government enterprise has in the course of years developed into an up-to-date, well-equipped and well-run railway system, which will stand comparison in every respect with lines of broader gauge. But one difficulty remained, namely, that the first line constructed had a gauge of 1.435 m and this became of practical importance when the government-owned narrow gauge railroad system was linked up with the Netherlands Indies Railway Company's lines. Goods to be conveyed by direct communication between the government lines and the lines of the Netherlands Indian Railway Company had to be unloaded and re-loaded, while on through journeys goods had to be twice transferred from one van to another, and the passengers were also obliged to change twice. Obviously, under the circumstances, it was impossible for traffic between Eastern and Western Java to develop, and so a way was sought by which this trouble might be overcome. A solution was found in the laying of a "third rail" between Djokjakarta and Soerakarta. This means that all along the section of the line belonging to the N.I.S. an extra rail was laid whereby it became possible to use the track for rolling stock of two different gauges. This device improved matters considerably, but in the long run it was not entirely adequate. For one thing it meant that the government railways' express trains were forced to limit themselves for the 60 km of this track to the maximum speed allowed on that particular line. Furthermore the service ran less smoothly than it might, because two different systems with more or less divergent interests were involved, and finally, there were difficulties connected with the scale of charges. The upshot was that the Government decided to lay a separate line of its own between Djogjakarta and Soerakarta. When the construction of this new track was completed the way was clear for tackling the question of increasing the speed of express service between Batavia and Soerabaya (a distance of 830 km), and advance in this direction was accomplished in due course.

Meanwhile little attention had been paid by the government railways to communications on the North coast of the island, but this need was well supplied by other means. The Netherlands Indies Railway Company extended its lines from Semarang via Tjepoe (an important center of the *Bataafsche Petroleum Maatschappij* belonging to the Royal Shell group) to Soerabaya. This track was completed in 1900.

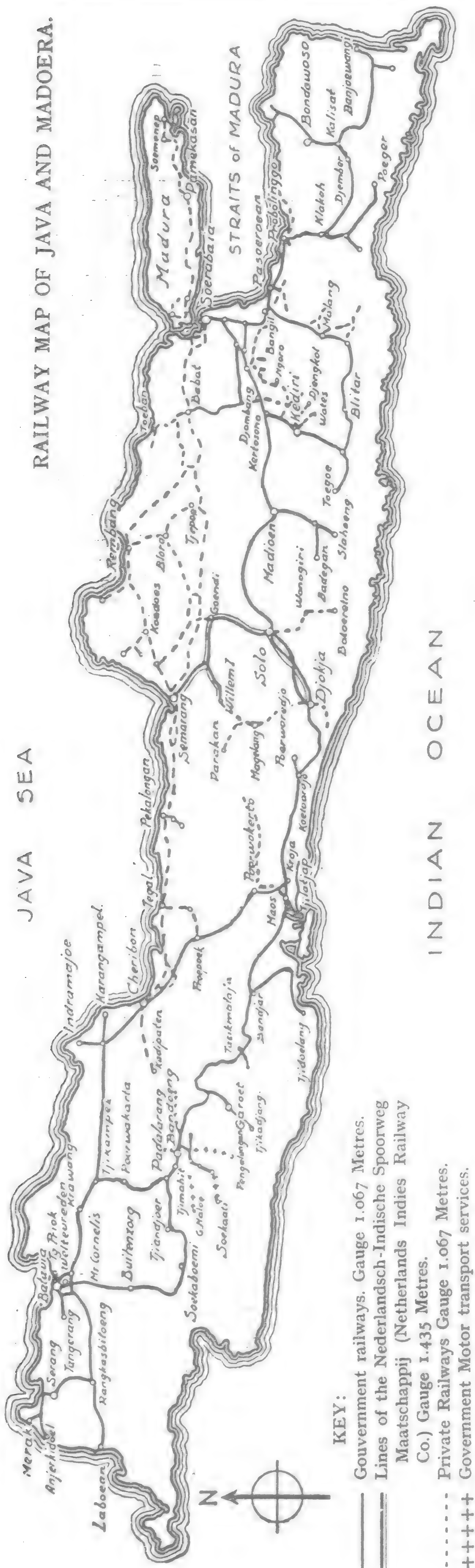
Furthermore, the Semarang-Cheribon Steam Tram Company established itself on the North coast of Java. The main service run by this concern is one from Semarang along the whole of the North coast to Cheribon (completed in 1897) and calling at Pekalongan and Tegal—both important centers. Only the link between Cheribon and Batavia was now lacking to complete the railway system planned for Java. This communication became a matter of importance when various agricultural enterprises—the

\* Marked Solo and Djokja on the map accompanying this article.

† The Buitenzorg-Batavia line was transferred to Government ownership in 1913.



JAVA SEA



The Atchin Tram was originally meant chiefly to assist in pacification work and was at the time under military control. When the work for which it had been constructed had been accomplished, it was handed over to the government railways in Java. The gauge used is 0.75 m, which means that this line will always be one of secondary importance, although it



has lost none of its value locally. From a financial point of view, however, it is of comparatively little moment.

The government railways on Sumatra's West Coast were built in response to the needs of the important coalfields along the river Ombilin, and the financial results of their exploitation have always depended very largely on the degree of prosperity enjoyed by the government coal mining industry. It is only natural, therefore, that at first this line—partly a rack-railway and passing through the beautiful Anai Pass—was run by the mining authorities. It was only transferred to the Java railways administration in 1917.

The government railways in Southern Sumatra are of recent date. It was only in 1911 that the decision to construct them was finally made, and the object in view was the opening up of a country—comprising portions of the Residencies of Palembang, Lampongs and Benkoelen—that had so far remained in a backward condition. The question whether they could be made to pay was not regarded as one of prime importance. The probable yield was estimated at 0.25 per cent of the capital invested in the construction. In this area are several rivers which, though large, are only really navigable during part of the year, and besides the products of the government coal mines (the Boekit Asem mines) there are other kinds of freight on which a railway company might count—namely, a considerable amount of coffee and pepper, while great quantities of rubber are also produced in this locality—mainly by the native population. The country is comparatively sparsely populated, so that very little passenger transport can be counted on. As a matter of fact the financial yield of the enterprise has far exceeded expectations.

In the above I have tried to describe very briefly the rise and development of railway enterprise in the Netherlands Indies. The accompanying map of Java will serve excellently to help the reader to orient himself. In what follows special attention is paid to the largest railway enterprise in the Indies, namely, the Government Railways, with special reference to the development thereof in Java.

That the government railway enterprise is the largest in the Indies is shown by the following figures:

The Netherlands Indies Government owns a total of 4,300 km of railway, 2,299 of which are in Java. This is more than the sum of all the lines in the mother country, more than Norway or Bulgaria possesses, and about equal to the Belgian National Railways.

The government enterprise is between eight and six times as large as the biggest of the private companies in the Indies. The system formed by all lines in the Archipelago combined totals 7,300 km of road, which means that 60 per cent of the entire network is in the hands of the Government.

The Netherlands Indies Railway Company owns 855 km; the Semarang-Cheribon Steam Tram Company 373 km, while the lines belonging to the Deli Railway Company total 553 km.

The government trains run about 72,000 km per day, i.e., 1.8 times the circumference of the globe. On these lines are 600 stations and 4,805 bridges (332 bridges on the Batavia-Bandoeng line alone); the number of tunnels in Java is ten. If all the rolling stock were made into one long train it would measure 170 km. The total number of sleepers is six and a half million; placed end to end these would cover a distance of 13,000 km. It is obvious that the construction of these lines cost a great deal of money; a round 630 million guilders was invested in lines which for the most part do not pay.

Yet the enterprise has been profitable in various ways. A total sum of 450,000,000 guilders has been deposited in the treasury

in the course of more than 60 years of government railways. This represents the net balance over this period, or in other words the total receipts less:

- (a) the ordinary costs of exploitation,
- (b) renewal and depreciation,
- (c) recoupment for damage from disasters and accidents,
- (d) contributions to employees' pension fund.

If we may regard the indirect returns accruing to the government in the form of increased prosperity due to the acquirement of railways as interest on the capital invested, then the results achieved are satisfactory.

An enterprise of this kind naturally gives employment to a large number of people. In 1929—the last year before the depression—the employees were 46,000 strong and classified as follows:

- Higher Officials: 187;
- Subordinate Officials: 2,731 (chiefly Europeans holding supervisory posts);
- Lower personnel 42,541 (exclusively natives).

These figures clearly indicate that this enterprise is being Indianized, as it is called, and experience has shown that under the leadership and supervision of a comparatively small number of Europeans indigenous personnel may be trained into excellent railway men. The natives have a distinct aptitude for mechanics, make excellent engine drivers and are also valuable workmen in the yards.



A sleeping car on a Netherlands Indies Railway

Before we proceed it may be well in the interests of a real understanding of the subject to mention certain characteristic features of the enterprise in Java. Owing to its form and extent this island, the axis of which runs practically parallel with the equator, produces very much the same crops everywhere. The result is that there is only a rather limited local exchange of products. Transport is almost all to and from the sea ports, of which there are a comparatively large number along the North coast. The most important of these reading from West to East are: Batavia,

Cheribon, Semarang, Soerabaya, Probolinggo, Banjoewangi. Now the policy of the great shipping companies as to charges makes it a matter of indifference to which port goods are shipped and at which harbor export commodities are picked up; hence transportation is naturally to the nearest harbor by the shortest route.

The population of Java is divided into three distinct ethnic groups—the Soendanese, Javanese and Madurese. From the point of view of travel there is comparatively little intercourse between the rural population of these three groups.

One way and another it has come about that, whereas the longest distance over which freight can be transported is 1,300 km, the average distance goods are actually carried is 100 km. The average distance travelled by native passengers is 30 km. Hence the railways have to provide for a large number of passengers over short distances, and to arrange their time-tables to suit this demand. But long-distance traffic has to be reckoned with too, for it is not inconsiderable as we shall see later when dealing with the subject of day and night express trains, running every twenty-four hours between Batavia and Soerabaya—a distance of 830 km. or from Amsterdam to Basle.

We will now try to give the reader some idea of the unfavorable reaction of the depression on the railway industry in the Indies and of the measures taken to counteract this.

In 1929 the railways reached the peak of their prosperity and then in 1930 the depression set in with great severity. The following figures show clearly the course of the depression in so



far as it affected the receipts and disbursements in the years 1929 to 1937 inclusive (in thousand guilders).

		Receipts from		Gross receipts	Running expenses	Gross surplus
		Passenger traffic	Freight traffic			
1929	..	22,950	59,788	82,738	51,573	31,165
1930	..	20,311	50,075	70,386	50,996	19,390
1931	..	15,969	40,551	56,521	44,569	11,952
1932	..	12,362	31,913	44,275	36,202	8,073
1933	..	10,331	23,687	34,018	30,222	3,796
1934	..	9,174	21,080	30,255	26,928	3,327
1935	..	8,368	20,314	28,682	25,345	3,337
1936	..	7,911	20,049	27,961	23,814	4,147
1937	..	10,148	23,973	34,121	24,512	9,609

From the above we see that the gross receipts during the years of the depression gradually decreased, till in 1936 they were 66 per cent less than in 1929. The running expenses fell 53 per cent during this same period, while the gross surplus was reduced from 31 to four million guilders, which means a drop of 87 per cent.

The net-balance is in still worse case, as is shown by the statistics which follow.

		Gross surplus	Renewals and depreciation	Repairs	Contribution pension fund	Net balance
1929	..	31,165	3,253	466	3,520	+ 23,926
1930	..	19,390	3,843	118	3,200	+ 12,229
1931	..	11,952	3,591	140	3,200	+ 5,021
1932	..	8,073	2,507	77	3,120	+ 2,370
1933	..	3,796	2,641	197	2,668	- 1,171
1934	..	3,327	4,387	27	2,081	- 3,168
1935	..	3,337	3,265	30	1,796	- 1,754
1936	..	4,147	2,741	25	1,602	- 221
1937	..	9,609	2,440	36	1,614	+ 5,519

1 = one thousand guilders.

From 1933 to 1936 the government railways were obliged to enter a deficit on their balance sheet—for the first time in the 60 odd years of their existence.

Careful consideration of the above figures will immediately make clear that during a depression the receipts drop more rapidly than the disbursements. This is quite a normal state of things everywhere in the railway industry and easy to explain. For between working costs and the volume of traffic there is a definite relation rooted in what are known as fixed charges incidental to the running of the service. On the basis of experience gathered all over the world this fixed relation between the fall in running expenses and the decrease in traffic has been determined and it now serves as a measuring rod by which to gauge whether a given

situation is normal or not. The following figures illustrate the above:

Reduction of traffic						Corresponding to reduction of current expenses
0%	..	..	..	..	..	0%
10%	..	..	..	..	..	1%
20%	..	..	..	..	..	4%
30%	..	..	..	..	..	9%
40%	..	..	..	..	..	16%
50%	..	..	..	..	..	25%
60%	..	..	..	..	..	36%
90%	..	..	..	..	..	49%

The drop in traffic is determined by the decrease in the number of kilometers covered by passengers and the number of ton-kilometers booked for freight. In the following survey the decline in traffic (i.e., the number of passenger-kilometers added to the number of ton-kilometers) is set against the decrease in the running expenses during the depression period; the corresponding figures for 1937, when the balance of economic conditions suddenly took on a new aspect, are also reproduced.

From these statistics we may conclude that the government railways have more than come up to expectations, while they also show that the increase of receipts is more rapid than that of disbursements.

		Volume of business in thousand guilders	Percentage	Decrease in percentage	Decrease in running expenses	(X)
1929	..	2,648,672	100 %	0 %	0 %	
1930	..	2,496,231	94.2%	5.8%	1.2%	( 0.5%)
1931	..	1,995,735	75.3%	24.7%	13.6%	( 5.5%)
1932	..	1,635,371	61.7%	38.3%	29.8%	(14 %)
1933	..	1,436,202	54.2%	45.8%	41.4%	(20 %)
1934	..	1,389,872	52.4%	47.6%	47.8%	(24 %)
1935	..	1,321,336	49.8%	50.2%	50.9%	(25 %)
1936	..	1,363,351	51.4%	48.6%	53.9%	(24 %)
1937	..	1,759,433	66.4%	33.6%	52.5%	(10 %)

The figures in brackets under (X) indicate the theoretical decrease in the running expenses corresponding with the decline in traffic accepted as normal.

The enormous, and direct influence of the unfavorable economic situation on the financial condition of the Indian railways is not hard to understand, when we consider that the Indies is the land of export *par excellence*. When the export business is poor, this fact is immediately reflected in railway figures. Tea, coffee, cinchona, rubber, pepper and, last but not least, sugar are the commodities that determine the receipts of the railway industry

in the Indies. Sugar plays a particularly important part in this. Some of the railway companies are entirely dependent on this article, and sugar is important for the government railways, too, as evidenced by the fact that in 1937 the receipts obtained from transport of sugar constituted 18 per cent of the total yield of the government railways' freight traffic, while in 1929 the percentage was almost 26. in spite of a fact we must not forget, namely, that sugar is produced only in Java. Mineral oils also contribute largely to the returns from the transport of freight (seven per cent in 1937), and rank fourth among commodities from the point of view of income from freight.

Hence while the depression set its mark on the financial returns of the railway industry, there is another very important, and in part permanent, factor that also affects returns to a considerable degree. Concurrently with the depression



Showing interior first class compartment in sleeping car by day and as arranged at night



motor traffic began to claim a share in the transport industry and it was the depression itself which facilitated the realization of its demands.

The serious fall in the prices of products and the decline of buying power, particularly among the native population, kept the demand for cheaper means of transport ever on the increase. Motor road transport, badly organized as it was and for the most part in the hands of persons with little capital at their disposal and often lacking even the most elementary notions of business management, began a destructive campaign in the fields of transport economy, and this was eagerly made use of, though the promoters of this motor transport met with repeated financial difficulties—all at the community's expense.

Hence the progress of railway enterprise was obstructed by two enemies, which had to be met and conquered separately and by different methods.

There are other circumstances that promote the capture of business by the motor-transport concerns. In the first place, the physical features of Java sketched above. Owing to these the distances over which goods are transported are short in spite of the great extent of the island. Another no less important factor is the policy, past and present, of the government railways in regard to rates, which they make proportionate to the value of the commodity carried. The basis of the charges policy is the transport value of the article, in other words, the freight charges are determined with special reference to the *transport value*. This means that freight charges depend on the difference between the market value of the given article at the places of destination and export (Hence, the charges are based on "what traffic can bear"). This policy has involved the development of a highly differentiated scale of charges: for goods with a high transport value high rates were charged, while those with a low transport value were carried at rates lower than the cost of transport.

It was therefore easy for motor-car transport to take the cream off the carrying industry by aiming chiefly at commodities with a high transport value, while leaving the articles with a low traffic-co-efficient to the railways.

If it can be proved that in principle the railways are indispensable to the welfare of the community in the Indies, then in the interests of this same community measures must be taken to put down the unbridled competition of motor-vehicles.

Besides there was another, and important, function to which the motor-transport industry could devote itself in the interests of public welfare. Most of the agricultural enterprises are situated at a considerable distance from the nearest railway station; the products of these estates were carried to the railway by primitive vehicles drawn by buffaloes or by motor lorries owned by the estates themselves. Here was a field of activity for motor traction lying fallow, and fortunately the railways have succeeded in coming to agreements with *bona fide* business men by which combined motor and railway traffic arrangements have been made which have even proved beneficial to both industries.

The railways have had to fight the motor-transportation enterprises on the subject of charges, too—usually with success. A typical instance of such a struggle is that connected with the

fare charged passengers in the fourth class (the class intended for the native population), which on several lines has been reduced to 0.6 cents per km.

All things considered the authorities felt that ways and means must be devised to restrict this unbridled and undesirable competition. After several unsuccessful efforts had been made to regulate the matter, the "Road Traffic Ordinance" was finally published and this has to a very large extent brought order into the traffic chaos (1936). This ordinance may be summed up as follows:

*Object.*—Traffic must be economically regulated without actual protection of any one means of transport and without serving the interests of any special transport enterprise.

*Passenger Traffic.*—A public motorbus may only run by virtue of a certain licence, stipulating transportation and exploitation requirements. Taxis and autolettres carrying less than eight persons may run without a licence.

*Freight Traffic.*—Theoretically the traffic is not subject to licence regulations, but the Governor-General is empowered to make a ruling to the following effect: when on certain routes along which one or more traffic companies carry on regular services by public freight motors of a nature to cause serious economic difficulties it shall be prohibited to convey goods except by virtue of a licence. These licenses may be granted under certain conditions which, however, do not stipulate exploitation requirements and only partly stipulate transportation requirements.

As regards passenger traffic—this ordinance has regulated matters so as to get round the difficulties created by the pirate bus services. No solution of current problems has as yet been found in regard to freight traffic and there is not much hope of any very satisfactory settlement being arrived at, since in actual practice it is very difficult to find a criterion for the laying down of transport requirements. The regulations made must be regarded as a *first step*. Further steps will be necessary for the adequate settlement of this matter. As to the question of co-ordination of traffic—this will have to be treated separately and falls outside the scope of this article, although it is certainly important. Meanwhile the results that have flowed from the Road Traffic Ordinance so far cannot be said to be disappointing.

The measures necessary to overcome the consequences of the depression were of quite a different character.

At first people thought the depression would last only a short time, but it very soon became evident that it would be a lengthy affair and that expenses would have to be permanently brought down to a lower level. It was therefore imperative to aim at economizing along the whole line without, however, imperiling the intrinsic value of the rail transport system. The watchword was to be: quantitative retrenchment combined with qualitative improvement.

Retrenchment could only be attained by rationalizing of work and increasing the specific effort of the individual. To reorganize the management was the first requirement and this was effected in several stages. The results obtained from these re-arrangements can be best demonstrated to the reader by giving



Corridor of sleeping car in the Netherlands East Indies



him a comparative survey of the reduction of the number of employees during the years 1930 to 1936 inclusive :

Employees	1929	1930	1931	1932	1933	1934	1935	1936
Higher officials ..	187	191	201	186	153	137	117	103
Subordinate officials..	2,753	2,731	2,850	2,556	2,249	2,022	1,800	1,675
Lower personnel ..	42,541	43,407	41,039	36,544	32,369	30,166	27,066	26,887
Total ..	45,481	46,329	44,090	39,286	34,771	32,325	28,983	28,665

Since January 1, 1930, the following reductions have taken place :

Higher officials ..	..	..	101 persons or 50%
Subordinate officials ..	..	..	1,587 persons or 41%
Lower personnel ..	..	..	13,870 persons or 35%

This retrenchment was made possible by distributing the work in the offices and in the stations among fewer persons by combining jobs ; and in the workshops by rationalizing the activities there.

It may be interesting to say a few words about the workshops. Originally there were six of them in Java, each fully equipped for all possible needs in connection with the repairs and upkeep of engines and other rolling stock. Rationalization, however, led to concentration of the work in different workshops and its classification under three heads. This led to there being :

- (a) a workshop for locomotives
- (b) a workshop for railway carriages
- (c) a workshop for wagons

This arrangement reduced the number of workshops from six to three, while at the same time it increased the volume of work at each center and thereby made feasible the application of certain improved methods of work and warranting the use of certain special implements and machinery. In other words it now became possible to equip the one central workshop much better and more completely than it had been to fit up three or more smaller ones far apart from one another. Better equipment made it possible to raise the quality of the product to a higher level, and further to apply such economical methods that the costs of production of the centralized department were considerably reduced. The figures given below illustrate this point clearly :

Year	Average number of Employees	Wages paid f	Average costs per			Average of man hours worked per		
			Engine f	Carriage f	Wagon f	Engine	Carriage	Wagon
1927 ..	5,491	2,439,264	5,330	394	95	14,903	1,167	226
1932 ..	4,700	1,358,380	4,364	389	71	11,474	1,049	191
1937 ..	3,276	801,585	3,103	598	59	9,811	2,090	143

The increase of costs and time needed for repair of carriages is due to the thorough improvement in accommodation and fittings undergone by these vehicles in the course of repair.

The following may serve to give the reader some idea of the qualitative improvements brought about during the years of the depression.

At first the general opinion was that the rapid decrease in traffic volume could be neutralized by reducing the service and the speed of the trains, but very soon it became evident that this view was mistaken, and that on the contrary the remedy must be sought in speeding up the trains, increasing their frequency,

improving the service generally and, in short, in making the railways popular.

These measures have certainly proved effective. As remarked above the construction of the line connecting Cheribon and Kroya, and further the building of a free unhampered government line between Djokjakarta and Soerakarta made it possible to bring the two most important commercial centers of Java—namely, Batavia and Soerabaya—into closer touch with one another by running a one day express between them. This service was opened at the end of 1929, the total distance of 830 km being made in about 13½ hours, or in other words the average speed was 62 km per hour. Since then the time required has been reduced to 11½ hours, which means an average speed of 73 km.

Meanwhile good and frequent trains were also running between the other important centers. One of those which deserve mention is the express between Batavia and Bandoeng (four times each way every day) and that between Soerabaya and Malang (twelve trains each way daily). The journey from Batavia to Bandoeng has been reduced from 4 hours to 2¾ and that from Soerabaya to Malang from 2½ hours to one hour and a half.

The service intended to supply the needs of the great crowds of native passengers also includes quick trains and furthermore, it became necessary to increase its frequency. The pace at which the native lives has been accelerated by the presence of modern means of transport. Accommodation in the carriages has also been very much improved.

An exceedingly important event in the history of the Indies Railway Industry was the institution of the Night Express between Batavia and Soerabaya. Of course the question of travel by night had been considered repeatedly from time to time, but every time the subject was broached the difficulties connected therewith seemed insuperable. Experience has now however shown that these difficulties were merely theoretical.

When once the authorities decided (in 1936) to start running a night express between Batavia and Soerabaya the plan was carried forward with great energy. The bodies of the sleeping-carriages were constructed in the railway's own carriage workshop at Manggarai (Batavia). The underframes, axles and wheels needed were taken from mail-carriages no longer in use. This method reduced construction charges for these carriages to a minimum.

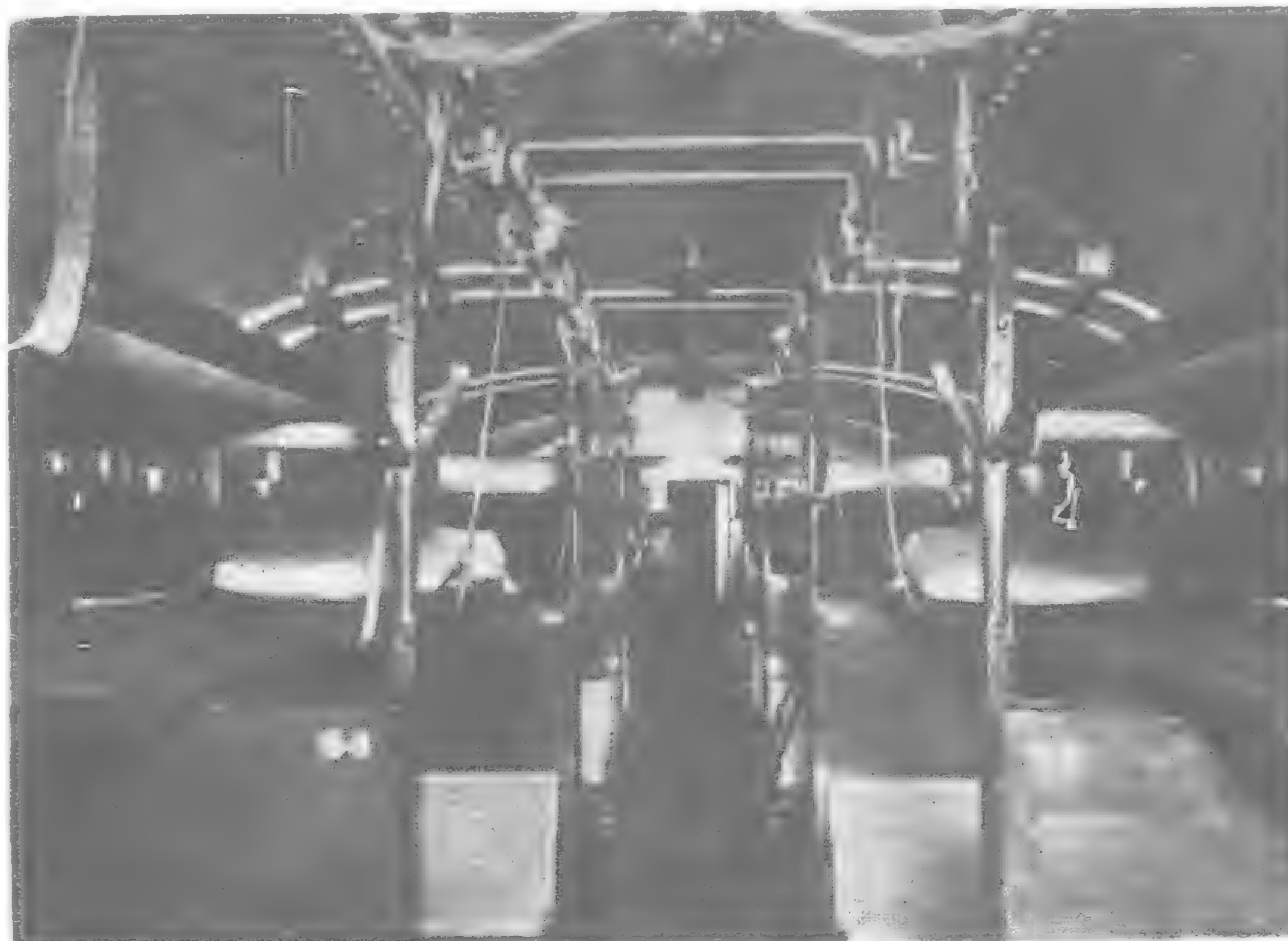
And so on November 1, 1936, the night service was opened and it immediately promised to be a success. The sleeping carriages compare favorably with European first-class night accommodation, while the fares were kept as low as possible. The carriages in use at present are 20 meters long and three wide ; they are constructed entirely of steel and all joints are welded. Special attention has been paid to making the interior comfortable for both night and day travelling, the *European de luxe* trains being taken as models in this respect. Experience has shown that in

spite of their greater width and greater length, and notwithstanding the fact that the railway's gauge is 1.067 meters, these carriages ride quietly and steadily.

The accompanying photographs show the exterior and the interior of one of the carriages.

The charge for a berth in the sleeping car was set at f10.—first class and f6.—second class—a very low fee as compared with corresponding ones in Europe. The night train includes a well-arranged dining carriage in which in the evening an excellent dinner may be had for the very reasonable sum of f1.50 and an elaborate breakfast is served for the inconsiderable sum of f0.75.

The sleeping car includes a bathroom.



Third class sleeping accommodations on a Netherlands East Indies Railway



The night journey still takes 13½ hours. The train leaves Batavia or Soerabaya at 6 p.m. and arrives at its destination at 7.30 a.m. next morning. This means that passengers have all day for business before taking the night express back home in the evening so as to be able to re-commence work the following day. One of the supposed difficulties in the way of night service had been that the indigenous population was thought to be averse to night travelling. But this does not seem to be the case at all. Quite the contrary, as is shown by the fact that it has been found necessary to meet the needs of this section of the travelling public by providing night accommodation at a very low rate. A very simple solution of the problem was found: a stretcher-like bed, so constructed that it could be set up in the ordinary third class carriages, was devised. A number of these are taken along in the luggage van and brought out for use as required. The accompanying photograph illustrates the point. This primitive sleeping accommodation is much in demand among the native population. The charge made for it is f 3.—.

Another (theoretical) objection against the night express was that such a service would compete with the day express. But this difficulty has also proved imaginary. It very soon became clear that each train filled a separate need of the travelling public, so that an increase of night traffic does not necessarily mean decrease of day traffic and vice versa. The following table illustrates this point:

Receipts from express trains in 1938				Receipts in 1937 Total
	1st and 2nd class	3rd class	Total	
Night Express .. ..	f 571,073	f 284,292	f 855,365	f 736,521
Day Express .. ..	„ 281,817	„ 427,462	„ 709,279	„ 625,539

From the above we may conclude that the night express is more in vogue with first and second class passengers, while the day express attracts more third class traffic. Since the returns of the night express in 1938 were 16 per cent more than in 1937, and that of the day express 13 per cent, we are presumably justified in the assertion that the two services are not mutually obstructive to any extent.

The figures which follow show that the night express is steadily growing in popularity.

Period	Number of passengers carried			
	1st class	2nd class	3rd class	Total
November and December 1936.	1,041	1,426	4,160	6,627
For the year 1937 .. ..	7,305	10,153	26,411	43,869
„ „ „ 1938 .. ..	8,902	11,866	29,735	50,503

Nor have the railways been backward in the field of freight transport. The re-organization assigned a large place to a division called "acquiring custom." During the monopolistic period of the railway industry little or no attention was paid to this department, but now matters have changed in this respect. There was even a time—and not so long ago (1917-20)—that more freight was offered for transport than could be handled with the available rolling stock, so that soliciting new business was no part of the program of work. Now all this had to be changed, but naturally it took time to impress the new condition of things on the minds of all employees high and low. The corps of freight inspectors is at present doing good work in this new field, faithfully assisted by the personnel of the station and freight services. Customers are called on regularly and repeatedly and many an important freight contract has been obtained as a result of these visits. The slogans adopted were: "Ask the S.S. and you'll get the proper service," and "the customer is always right."

An Advertising and Publicity department had been in existence for some time before the depression descended with all its weight, but its scope had remained very limited. Now much is being done in this field, too, in order to make the railways popular. Figures available indicate clearly how the development of this important part of the industry was taken in hand. Originally the expenditure on personnel totaled more than the sums spent on material and running expenses; now the converse is true. The work of this department is excellently performed by men well versed in the subject and trained for the job.

By participation in exhibitions; by the distribution of a monthly journal and folders; by advertising in the public press, by the publication of an attractive calendar and the like, the attention of the public is called to the excellencies of the railways and an effort is made to keep down the expenses of this department as much as possible by letting advertising space in the stations, along the railway track and, particularly, in the monthly. It is certain that the popularity of the railways is increasing by leaps and bounds. Opinions expressed in the press and by clients personally are good proofs of this.

But the very best proof of all is the fact that, in spite of the business slump that has followed the short period of revival in 1937, the receipts of the railways have continued to increase steadily. The total of receipts for 1938 was markedly more than that of the favorable year 1937; and the results for the first three months of the current year would seem to justify our expecting even larger receipts in 1939.

In order to make the present survey as complete as the scope of the article permits we ought to say a word or two about the subdivision of the service known as "Roads and Works." This particular department is important because the general characteristics of the soil in Java are such that the upkeep of the track is a really difficult matter and has been difficult from the time when the railways were first constructed.

We have already mentioned that there are very many bridges along the track. Obviously the upkeep of these is often a serious burden, and when the great mountain rivers overflow their banks during the West monsoon great damage is sometimes done at such points.

But apart from the above, a new task has recently devolved upon the department of "Roads and Works." We refer to rail-welding—a question which is being raised all over the world in connection with the railway business. The Indies railways, too, have also been obliged to face this problem and are already busy carrying plans thereanent into execution.

A whole article might be devoted to this subject. Very shortly stated in popular terms it amounts to this:

So far comparatively short rails (ranging between 6 and 13 meters) have been used. These sections were connected by means of fish-plates. But experience showed that wear and tear was most apparent near the fish-plates, and it was noticed that the rails became depressed towards the joints. To the resulting downward bend are due the unpleasant sound and the bumps produced by the train passing over the joints. These regularly recurring depressions in the track cause an undulating motion in the carriages which very materially increases the pressure on the rails if it so happens that the period between successive joint-shocks is not considerably longer than that which is called the "natural swing" of the train itself, this last being determined by the dimensions of the engine and carriage springs.

As speed increases the period between shocks decreases and approaches more nearly the natural swing of the train; this explains why speed increases the pressure on the track.

To alter the natural swing is practically impossible, but by lengthening the period between successive shocks the pressure on the rails may be lessened or the speed may be increased without the rails being submitted to an extra burden thereby. Rail-welding is therefore the means whereby the wear and tear on rails may be reduced by lengthening them and the expense of upkeep of track and rolling stock may be diminished. Obviously speeding up the train service made this problem of artificial lengthening of the rails an urgent one.

An incidental, but very important, result of the lengthening of the rails is the increased comfort to the passengers. Shocks being very largely avoided, the motion of the train becomes steadier and pleasanter.

The Government railways began lengthening rails by welding last year, the welded sections now measuring 50 meters.

Needless to say this survey does not pretend to be complete. Obviously, it would be impossible to deal adequately with a subject like the present within the limits of one short article. But perhaps enough has been said to give the reader some general idea of railway conditions in the Indies—an outline sketch, the details of which may be filled in on some future occasion.



# Tung Oil

(The China Exporter)

IN South China, where spring comes early, the hillsides are profuse with white flowers, stained with pink and yellow markings. They are not the dainty plum blossoms from which Chinese poets and painters down the ages derived creative inspiration; they sprout from wood oil trees, China's Number One cash plant. Despite hostilities, wood oil netted China \$89,845,563 in 1937 and \$39,237,038 in 1938. Its economic importance was most impressively demonstrated last December, when the United States' loan to China, amounting to U.S. \$25,000,000, was secured on China's wood oil exports.

Chinese wood oil, also known as tung oil, comes from trees belonging to the genus *Euphorbiaceæ*. Two principal species are found in China. The first one is *Aleurites Fordii* and the second is *Aleurites Montana*. Of these two, the former species is more important. Its flowers, which add no mean beauty to the Chinese rural landscape, precede the issuing of leaves. The fruit is apple-like, about the size of a small orange, at first green but turning brown in September when ripening. It is flattened round, with a short point at the summit, and is perfectly smooth on the outside. The fibrous flesh encloses three to five seeds, which are very slightly ridged and warty. The seeds somewhat resemble Brazil nuts, though they are much smaller in size.

In *Aleurites Montana* the flowers appear only after the leaves are fully developed. The fruit is egg-shaped, pointed at the summit and flattened at the base, with uneven ridges on the outside. The interior of the fruit is thick and woody and usually contains three compressed, round seeds. The two distinct species, apart from showing real differences in features, grow in different geographical areas.

Tung oil trees abound in the Yangtze Valley, particularly in the regions of the gorges and neighboring hilly country, up to an altitude of 800 meters. They are distinctly hillside plants, thriving in the most rocky section of the country and on the poorest soils, provided there is an annual minimum rainfall of 29 inches. The ideal climate for their growth is damp and warm, with copious rainfall and no frost. The tree is most ornamental in flower and foliage. It is a fast growing tree, seldom exceeding 25 feet in height, and has many branches. It begins to bear seeds in its third or fourth year, and declines rapidly when about twenty years old.

## Cultivation of the Tung Tree

Chinese wood oil trees are being cultivated by various methods. One system requires the sowing of the seeds early in the spring, two in a spot, about two inches deep and at a distance of from three to five feet apart. The spots are kept in loose condition, so that moisture may readily be absorbed. In about four weeks the seeds commence to sprout. When both seeds germinate the stronger one is selected for growth. After one year the seedlings will be about one foot tall. Then they are either transplanted to another nursery bed or direct to the plantation. In the latter case, the young trees are placed about seven meters apart in order to allow them room for expansion.

In the hilly regions of South China the farmers usually adopt more primitive methods. In Chekiang, for example, the farmers propagate the seedlings without transplanting. In these districts the trees are not permitted to exceed the age limit of ten years, because from the seventh year onward the yield drops below the profit point. On mountain slopes and hillsides, unsuitable for the raising of other crops, the trees are permitted to grow as long as they bear fruit. Whereas formerly the trees were permitted to grow wild on hillsides, they are now grown in a more regulated manner. The trees, and especially the seedlings, are now fertilized with wood ash and animal manure. In 1928 the authorities began to urge the farmers to plant not less than 300 trees per family.

As already stated, the wood oil trees luxuriate particularly along the Yangtze Valley, Szechuen and Hunan provinces being the largest producers of oil. Most of the trees in China are found in a zone between 25 and 24 degrees north latitude, from the sea-

coast to the western part of Szechuen, comprising an area of 750,000 square miles. The two Chinese species are geographically divided. While the *Aleurites Fordii* is met with along the Yangtze Valley in Central and Western China, the *Aleurites Montana* occurs in Southeastern and Southern China. The former supplies about 90 per cent of China's exports of wood oil and is therefore of much greater economic importance.

## Various Uses of Wood Oil

In the United States of America wood oil is chiefly used in the paint and varnish industry, and is highly valued because of its quick drying properties, especially in the automobile industry. The oil is also extensively used in the manufacture of linoleum, oil cloth and other fabrics requiring coating or waterproofing, in the manufacture of printing inks, and in a variety of miscellaneous products, including tin plating and artificial leather. It is becoming increasingly essential in the electrical industry, where it is used in the manufacture of insulating material.

In China, in addition to the above uses, the oil is sometimes used in remotely situated districts for illuminating purposes, though as such it is inferior to non-drying and semi-drying oils. Medicinally, wood oil is used in China in the treatment of boils, ulcers, swellings and burns. The tung tree timber is used for making trunks, over covers, musical instruments, and as building material. Wood oil is not edible and is therefore not used for culinary purposes. The cake, as a by-product left after expressing the oil, is used as a fertilizer. It is also supposed to be an effective insecticide and as such it is valuable because of its property of destroying the insects which infest the roots of plants. Thus, everything about the tung oil tree is useful. Of course, the greatest credit goes to the oil.

The fruit usually ripens in September or October, when it bursts, permitting the seeds to fall. Almost invariably, however, the fruits are gathered before they are dead-ripe and treated in either one of two ways. They are collected into heaps and covered with grass or straw. After fermenting, the thin fleshy part of the fruit is easily removed, leaving the kernel covered with a thin layer of husk which is usually decorticated by hand. Or the fruits, while still green, are placed into iron pans, about two feet in diameter and roasted until the husk opens and the seeds are released.

## The Process of Obtaining Wood Oil

Dr. Tien-gi Ling, an expert in the wood oil industry, describes the process of expressing the oil, according to native methods, as follows:—

"The seeds are placed in a large trough-like stone mortar, about three feet wide, and are ground to a fine meal by rolling with a stone roller, dragged by a horse, water buffalo or donkey. The meal is lightly roasted, transferred to wooden vats with wicker bottoms, and steamed over boiling water. The steamed meal is mixed with a little straw (to act as a binder) and is tamped into iron rings so as to form circular cakes about 45 centimeters in diameter and ten centimeters thick.

"After removal from the moulds the cakes are placed in a wooden press somewhat like an old-fashioned cider press. Each press is equipped with a system of wooden blocks and iron-capped wooden wedges for tightening. An iron-capped battering ram swung from a beam of the building is used to drive home the tightening wedges. The operator swings the ram several times and finally brings it down with great force on the wedges, driving the edge between the press blocks, so as to tighten the press and squeeze out the oil. The expressed oil is collected in a vat below the press. The crude oil is filtered through a series of grass cloths and is then ready for sale to the collector. . . . The crude oil is usually reddish yellow in color but may be brown or black if the seeds have been over-heated in steaming or pressing."

The oil, packed in wooden or iron barrels, then goes abroad.



## Export Under Control of Foreign Trade Commission

This crude method of extraction resulted in unevenness of color and quality, and it is estimated that about one-third of the oil available in the tung seeds was wasted because of the inefficiency of the process. As the oil passed through the hands of numerous intermediaries, prior to being shipped abroad, it was frequently adulterated with resin, mineral oil and other cheap substances. Realizing the importance of standardization and control, the Chinese Government established some three years ago a Testing Bureau, while the China Vegetable Oil Corporation, a Government sponsored institution, opened oil refining plants equipped with modern machinery in various centers of the country. The purchasing part is now concentrated in the hands of the Szechuen Oil Corporation. The Foreign Trade Commission handles the export end.

The price of tung oil in Chungking was \$25 per picul. When it was sent to Hongkong for export, the price would be \$90 as the merchants have to pay \$44 as freight, \$5.40 for package, \$6.50 for taxes and insurance, and \$9 for other miscellaneous expenses. As the price of tung oil in the Hongkong market was only \$60 Hongkong currency, the Chinese merchants found it difficult to export the product from Chungking to Hongkong. In order to remedy the situation the Foreign Trade Commission and the Szechuen Provincial Government have jointly taken action to assist the merchants in the export of their products. One of the actions taken by the authorities was to fix the price of tung oil in different districts of the province. According to the fixed rates published by the authorities which were to remain effective till November 31, 1939, the prices of tung oil in Szechuen were fixed, depending on locality, at from \$43.50 to \$47.50 per quintal.

## Szechuen, Main Producing Center

The Province of Szechuen ranks first in the production of wood oil, yielding approximately one-third, or 430,000 quintals of China's annual output, Hunan ranking second with 360,000 quintals, Kwangsi third and Hupei fourth with 180,000 and 160,000 quintals respectively. Prices in Hankow, which was the principal center of China's wood oil trade, ruled fairly steady throughout the year 1938, averaging \$50 Chinese currency per quintal. The high was \$57 in April, and the low about \$45 in October.

Exports of wood oil which in 1937 reached the record figure of 1,029,789 quintals, heavily declined in 1938, totalling 695,777 quintals only. Of these, 558,100 quintals went to Hongkong, with ultimate destination presumed to be the United States of America, which country took 80 per cent of China's export of the oil in 1937. The heavy decline in exports in 1938 is directly due to the hostilities, particularly the blockade of the Yangtze which closed the normal routes of shipment via Shanghai which formerly served as a port of outlet for 80 per cent of the oil, causing enormous transportation difficulties. It is reported that as a result of these difficulties large quantities of the oil-bearing seed, which is easily subject to over-fermentation, have gone to waste.

Due to the hostilities which broke out in Shanghai and suspension of American shipment along the China coast, the price of tung oil on New York soared towards the end of 1937 to 22 U.S. cents per pound as against the normal prices of 10 to 14 cents, and this encouraged the use of substitutes. Although prices in 1938 declined, ranging between 12 cents and 15 cents per pound, since the fall of Canton a state of uncertainty prevailed, adversely affecting the market. With the hostilities now isolating Hongkong, which became the principal port for export of the oil, and the tightening of the blockade of the South China coast, new outlets through French Indo-China and Burma have become necessary, and as these circuitous routes are extremely difficult, new and much greater obstacles to the export of the China tung oil are now being envisaged. The result of the blockade, which was already in strong evidence in 1938, is now being acutely felt, as the customs returns for the first six months of 1939 reveal. During that period exports of tung oil totalled only 217,491 quintals as against 415,530 and 539,026 quintals exported during the corresponding period of 1938 and 1937 respectively.

## United States Imports Record Quantity

During the year of 1937 the United States of America imported the record quantity of 175,000,000 pounds (800,000 quintals) of wood oil from China and Hongkong. The estimate of over five

million pounds for 1939 in home production has fallen short because of the frosts which devastated large areas of the plantations, thus awakening American tung oil interests to the realization of the unreliability of their domestic source of supply. Although experiments are being made at cultivation in New Zealand and Australia, the actual yield so far obtained in those areas is too small to be considered as competitive with the Chinese tung oil. Besides, as the world's production of wood oil increases, new uses for it are constantly discovered. Speaking, therefore, of the future of China's wood oil industry, it is safe to predict that the commodity will continue to dominate foreign markets for many years to come.

The following table shows quantitative figures for shipments of wood oil from China during the past three and a half years to the principal countries of destination:—

	Quintals 1936	Quintals 1937	Quintals 1938	Quintals *1939
Hongkong .. ..	60,169	212,364	558,100	200,201
United States of America	622,867	641,127	56,872	475
Great Britain .. ..	37,848	38,828	20,262	826
Germany .. ..	42,957	42,811	14,804	1,982
France .. ..	36,942	37,151	10,795	—
Netherlands .. ..	16,424	6,000	3,509	—
Other Countries ..	50,176	53,508	31,435	14,007
Total .. ..	867,383	1,029,789	695,777	217,491

Value in Chinese Dollars (000 omitted) ..	73,379	89,846	39,237	20,458
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\* January-June period.

## Colonization and Quinine

COLONISTS from Europe sometimes imagine that the soil of the tropics where they have decided to settle, is so fertile that it will yield an abundant harvest and that provided care is taken to protect oneself from the sun and climate, it will be an easy matter to earn a living. But as soon as they commence the struggle with tropical nature, they find out that once again appearances are deceiving. They must toil unceasingly, for in the damp regions of the tropics, the soil is generally diluted by the heavy rains and fertilizer must be used to help the scanty nourishment that the plants can still find in the ground. In sub-tropical countries, where little rain falls, the harvest is, on the other hand, threatened by drought.

Hence the would-be colonist should carefully think the matter over before making a start. Of course, those with the necessary capital available can use fans for cooling their houses and even carry out important agricultural labor at night with the aid of electric arcs. Also, it is now possible to obtain air-conditioning plant, by which a given temperature can constantly be maintained indoors.

But even with the use of electricity and air-conditioning appliances, the life of the colonist is far from easy, for his health is menaced by millions of insects. The colonist is in danger every day of his life. It is rarely that he escapes the debilitating and sometimes mortal action of malaria, unless he faithfully carries out the recommendation of the Malaria Commission of the League of Nations and to prevent malaria takes every day during the fever season six grains of quinine and for treating an attack of fever, a dose of 15 grains to 20 grains of quinine per day during five to seven days. On page 125 of its report, issued in 1938, this Malaria Commission stresses the fact that among the anti-malarial drugs, quinine still ranks first in current practice, by reason of its clinical effectiveness and almost complete absence of toxicity, coupled with the widespread knowledge of its use and dosage.

Quite recently, a number of different projects have been launched with regard to the colonization of virgin soil in Bolivia, the Equator (Ecuador), Colombia, Venezuela, Tanganyika, Madagascar and British Guiana, and the question of protecting the health of the colonists requires that special attention be paid to this point. Every colonist cannot afford to purchase an air-conditioning plant for his habitation, but there is one thing that he cannot do without, viz., quinine, for without this remedy he and his family are at the mercy of the most dangerous enemy: the malaria mosquito.



# Paper from Bamboo Made in Electrical Mill at Trinidad

By J. F. PRINCE, Export Sales Dept.,  
G.E.C. Engineering Works, Witton

*Bamboo is particularly well suited to the production of printing and writing papers, but it was not until comparatively recently that a satisfactory process was evolved for achieving this object.*

*The article deals with the process adopted at a Trinidad paper mill which is wholly electrified. A description is given of the machinery employed and the electrical equipment installed which includes generating plant, mill motors and control gear, distribution switchgear, cabling and lighting fittings.*

\* \* \*

THE production of paper from bamboo is a very ancient process, for the Chinese were engaged in the task long before the inhabitants of Britain had any use for paper. The Chinese laid bamboo stems in pits in the ground and covered them with lime, allowing the stems to rot for several months. They were then washed and beaten by hand into a pulp, which was bleached in the sun. After further washing and hand beating it was made into sheets of paper by hand.

About 40 years ago experiments were started with the object of making paper from bamboo by machinery, for bamboo is one of the best fibres available for the production of printing and writing papers. It was not until 1912, however, that success was achieved. James Bertram & Son, Ltd., Leith Walk, Edinburgh, then built a mill in China to produce 5,000 tons per annum of bamboo pulp. In 1919, this firm also built a paper mill in India to make printing and writing papers from bamboo, and a few years later the capacity of the plant was doubled. Since then two further mills in India, namely Titaghur Paper Mills and Bengal Paper Mills, have been equipped for converting bamboo into paper.

About the year 1914, Thomas Nelson & Sons, Ltd., of Edinburgh, purchased an estate in Trinidad, British West Indies. It is situated about six miles from Port of Spain amidst beautiful surroundings. In due course 1,000 acres were planted with bamboo. This is believed to be the first occasion on which bamboo was planted specifically for the purpose of paper production. A view down one of the avenues of the plantation is shown in Fig. 2. Eventually in 1935, it was decided to erect a mill on the estate with a view to converting the bamboo into paper pulp. The mill entered production about two years ago, and is capable of a weekly production of 100 tons of easy bleaching pulp of high quality.

## Layout of Buildings

A general view of the mill buildings is shown in Fig. 1, and their general layout is given in the plan reproduced in Fig. 6. It may be noted from this plan that in addition to the main mill, the principal buildings include boiler house and power house, engineers'



Fig. 1.—General view of Trinidad Paper Pulp Mill

maintenance and repair shops, and an acid making plant with adjacent chemical store. A 24-foot roadway and railway sidings running into the buildings afford excellent transport facilities to Port of Spain.

In addition to the buildings shown on the plan, administrative offices, Fig. 3, are situated on an adjoining part of the estate, also residential quarters which can be seen in the background of this illustration. A pump house to provide the large quantity of water required in manufacture is situated on the San Juan river, about a quarter of a mile from the mill.

## Mill Equipment

At first glance it might appear that bamboo would be an ideal material for conversion to paper pulp, as it is easy to handle and shred, but in practice there are many manufacturing difficulties, so that its treatment demands great care and, in addition, the processes employed involve a close degree of regulation. It follows that the equipment of the mill must consist of highly specialized machinery.

The principal sections of the equipment are the bamboo crusher controlled by hydraulic pressure, acid making plant, acid storage tanks, digesters, machine stuff chest, strainers, the main paper pulp machine, cutter, hydraulic baling press and weighing machine. To this list should be added many items of elevating and conveying plant. Electric power is used throughout the mill, and the complete electrification scheme was entrusted to the G.E.C., who manufactured and installed the power house plant and switchgear, motors for driving the mill equipment and pumping plant, motor control gear, distribution switchgear, lighting fittings and lamps, and cable consisting of paper insulated lead covered and armored power cables, V.I.R. lighting cable and hard drawn bare copper wire for use as transmission lines from the power house to the pumping station, administration buildings and residential quarters.

The mill equipment was supplied by James Bertram & Son, Ltd. The electrical equipment was forwarded to this company's works and the whole of the plant for the scheme was tested and co-ordinated prior to shipment. This greatly facilitated erection work on site.



Fig. 2.—One of the avenues through the bamboo plantation



## Power Supply and Distribution

The main power supply is from a 500 kva geared turbo-alternator, Figs. 4 and 5. The turbine runs at a speed of 6,000 r.p.m. and the alternator at 1,800 r.p.m., the supply being 440-volts, three-phase, 60-cycles. For week-end purposes a 50 kva oil engine driven alternator, Fig. 7, has been installed.

Both the alternators are controlled from the nine-panel main switchboard shown in the background of Fig. 4. For each machine there is provided a main control panel and a regulator panel. Four of the other panels control feeder circuits, while the ninth is equipped with automatic voltage regulating equipment.

Distribution is by means of ironclad panels situated at convenient points in the factory. Paper insulated lead covered and armored cable is used both from the power house to the distribution boards, and also for connection to motors and starters.

## Paper Pulp Production

In view of diseases to which bamboo is subject it is very important that, when used for the production of paper pulp, it should be cut at the right time. After cutting, it has to be well dried before use, and at the same time kept free from attack by insects which may play havoc rapidly with a pile of drying bamboo. Stacked bamboo at the intake end of the mill is seen in Fig. 8. The mill is arranged on the continuous process method, the bamboo entering at one end of the mill and emerging as finished sheets of pulp at the other; this feature is at once evident from the layout plan in Fig. 6.

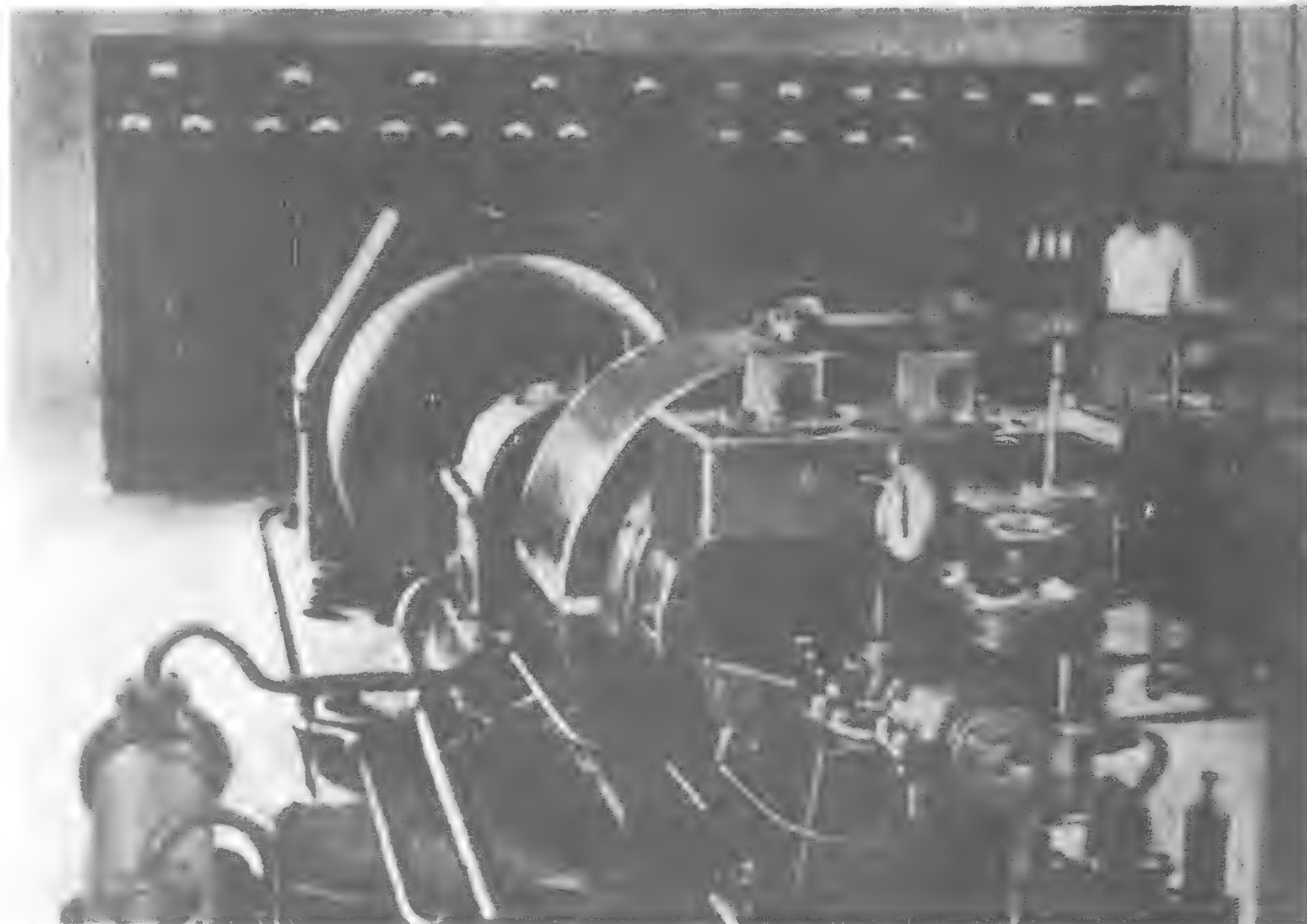


Fig. 4.—View in the Power House showing main generating set from the turbine end, with switchboard in background

The chips are fed next to digesters in which they are cooked with acid and steam at a pressure of about 90 lbs. per sq. inch.

The digesters have a capacity of about 12 tons and are built of 1½ inch steel plates lined with acid resisting brick. Special pressure and temperature recorders form a part of the digester equipment, all valves and pipe fittings being made from acid resisting steel. The necessary boiling mixtures for the digesters are prepared in the acid making plant, connection from which to the digesters is by means of acid resisting pipe and fittings.

After treatment in the digester, the contents are blown by pressure into large wooden vats or blow pits where the spent acid is thoroughly washed out and in due course the digested bamboo or pulp, which now resembles porridge, is pumped to the machine stuff chests and kept in constant agitation. Thence the pulp is taken to the main mill room, Fig. 11. It is diluted with clean water to a consistency of about 99 per cent and run by gravity over a series of sand tables and strainers, Fig. 14, so as to eliminate as much foreign matter as possible, through



Fig. 3.—Administration offices with residential quarters in background

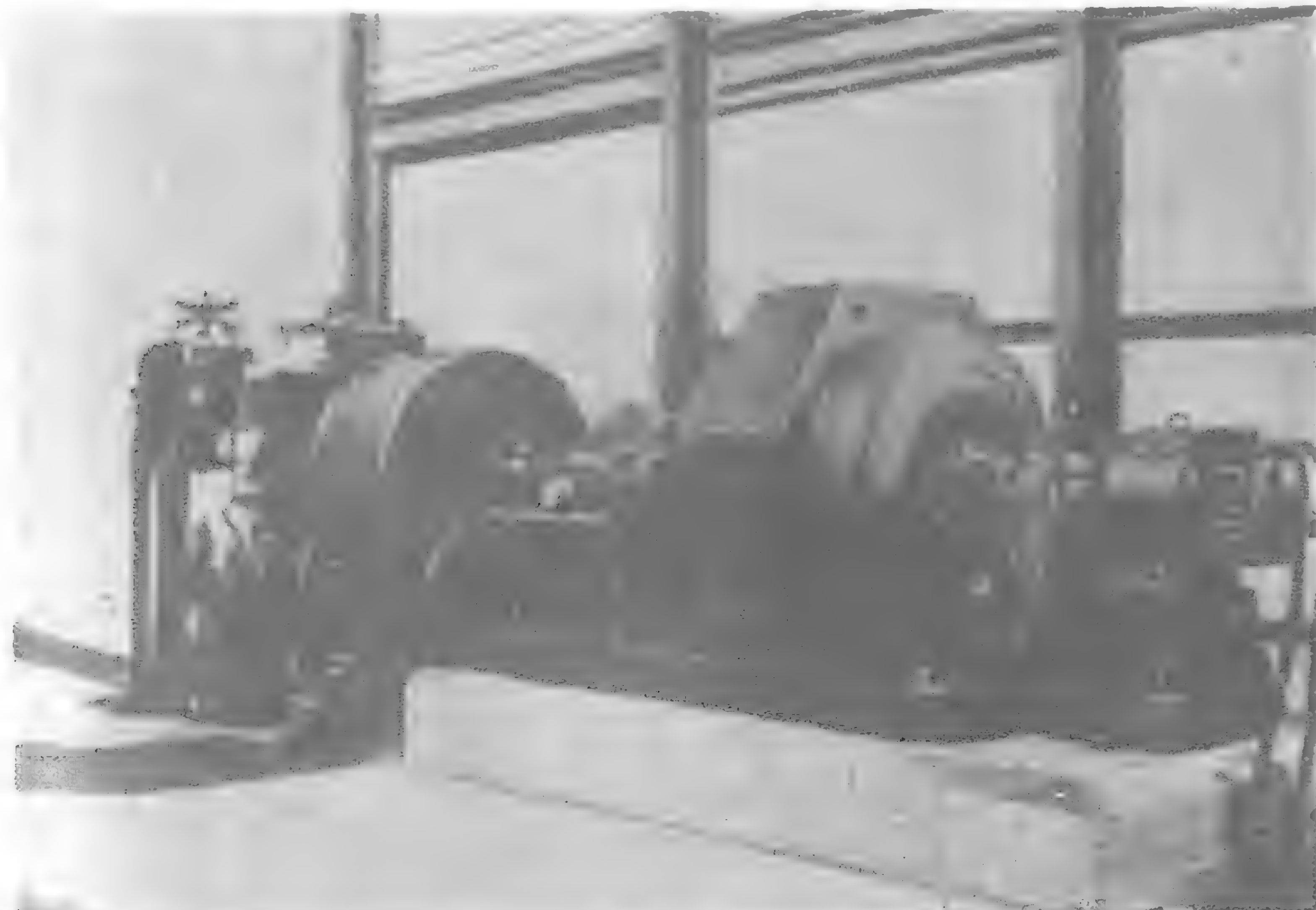


Fig. 5.—The 500 kva geared turbo set from the alternator end

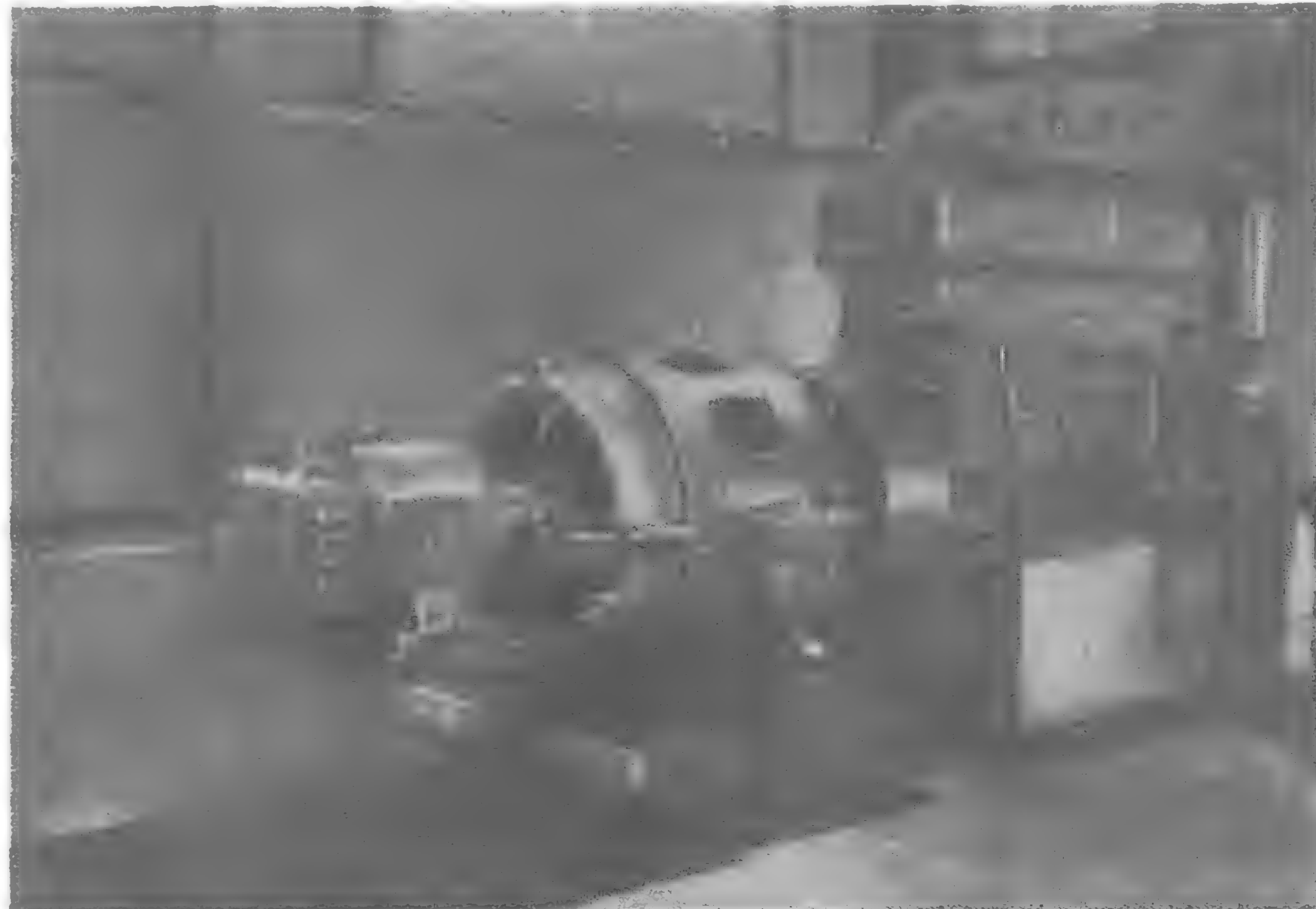


Fig. 7.—50 kva stand-by oil engine driven alternator



## ELECTRICAL EQUIPMENT OF TRINIDAD PAPER PULP MILL

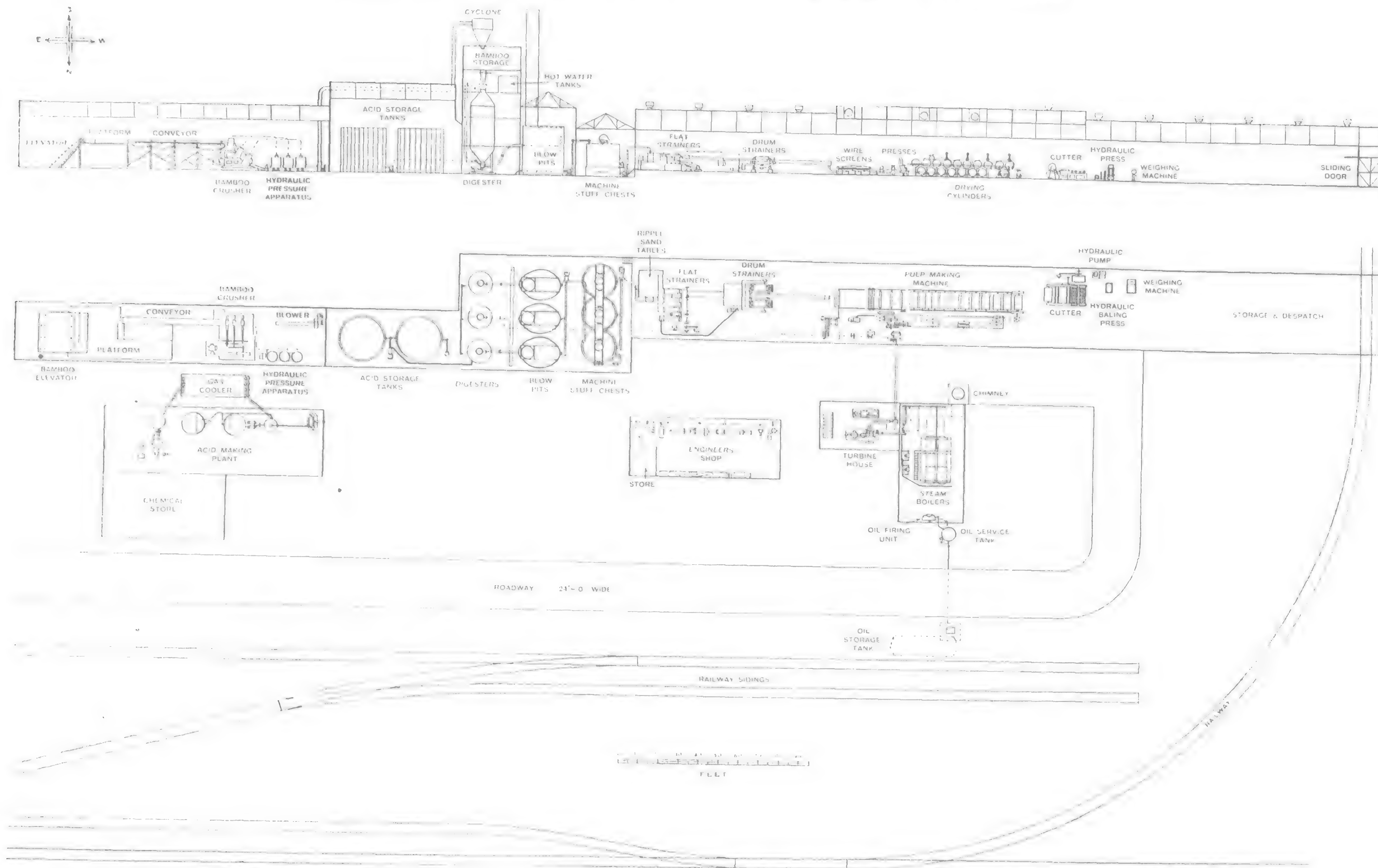


Fig. 6.—General layout of the Mill Buildings



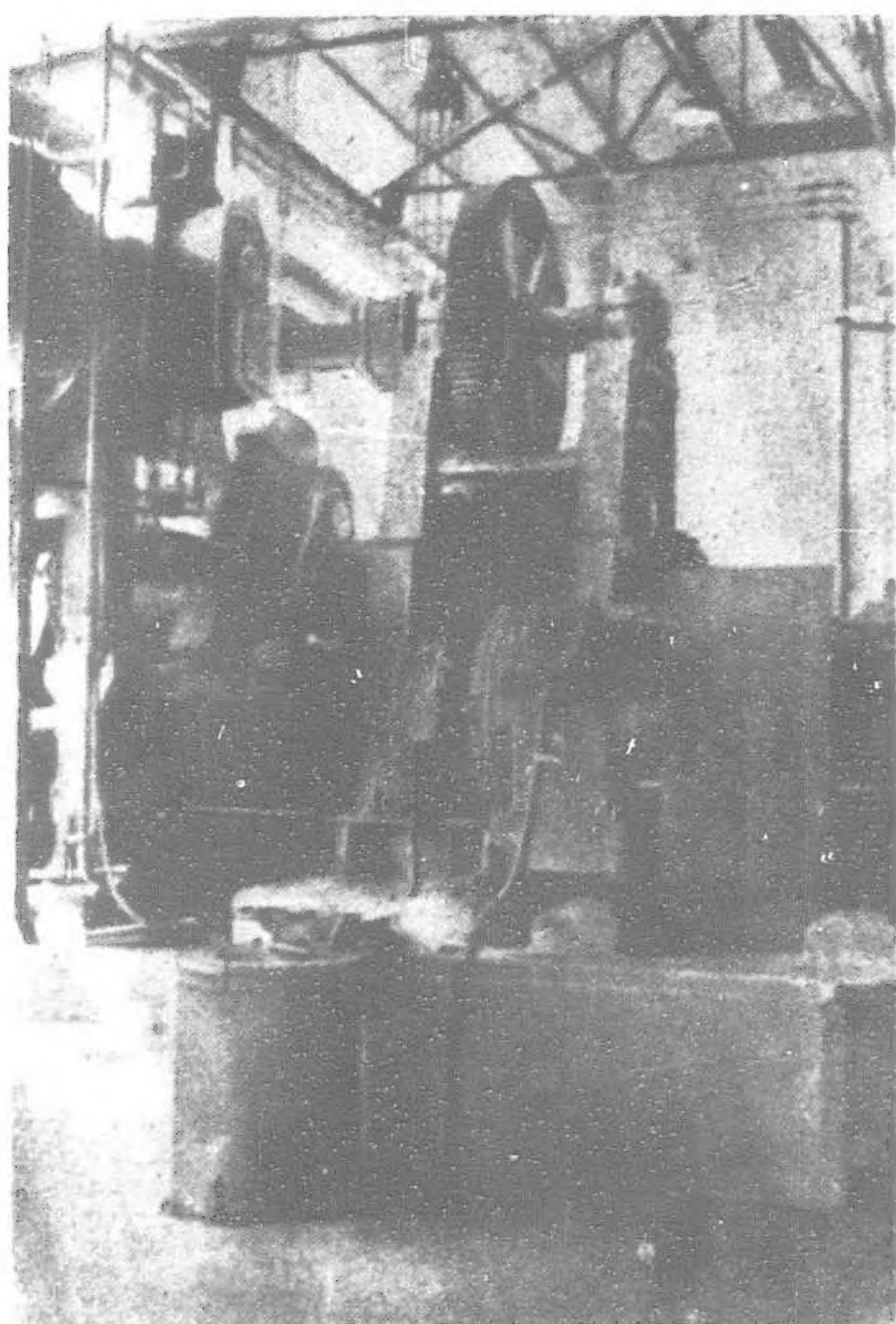


Fig. 9.—Bamboo crusher driven by 175 h.p., 700 r.p.m. slipring motor controlled by oil immersed rotor starter panel



Fig. 8.—Cut bamboo ready for passing into the mill

a washing plant, then on to the pulp making machine, Figs. 12 and 13.

The pulp making machine follows the general principles of the paper making machine. The pulp is fed first on to a continuous fine wire mesh screen, where initially the water is

gradually drawn off by natural drainage, and then removed by vacuum until the pulp has sufficient consistency to enable it to be taken from the wire screen on to endless woollen felt bands.

Once on the felt bands the pulp, which is now in one continuous sheet, is pressed between two sets of large brass rollers; this process extracts a large amount of water. The pulp is then taken over a

series of steam heated cylinders, where the remaining moisture is gradually evaporated. At the end of the machine the dry pulp is wound on steel rollers, then passed to the cutting machine where it is cut to suitable sizes.

Finally it is baled and packed under hydraulic pressure for shipment. The pulp, which is unbleached, is of a light grey color and after cutting resembles thick sheets of blotting paper.

The rolls of the paper machine are driven through belting by a 60 h.p. 700/250 r.p.m. slipring motor controlled from an oil switch and drum controller. The slipring motor driving the cutting machine is rated at 9 h.p. 1,140/380 r.p.m., and is controlled from a contactor switch and rotor regulator. Reference individually

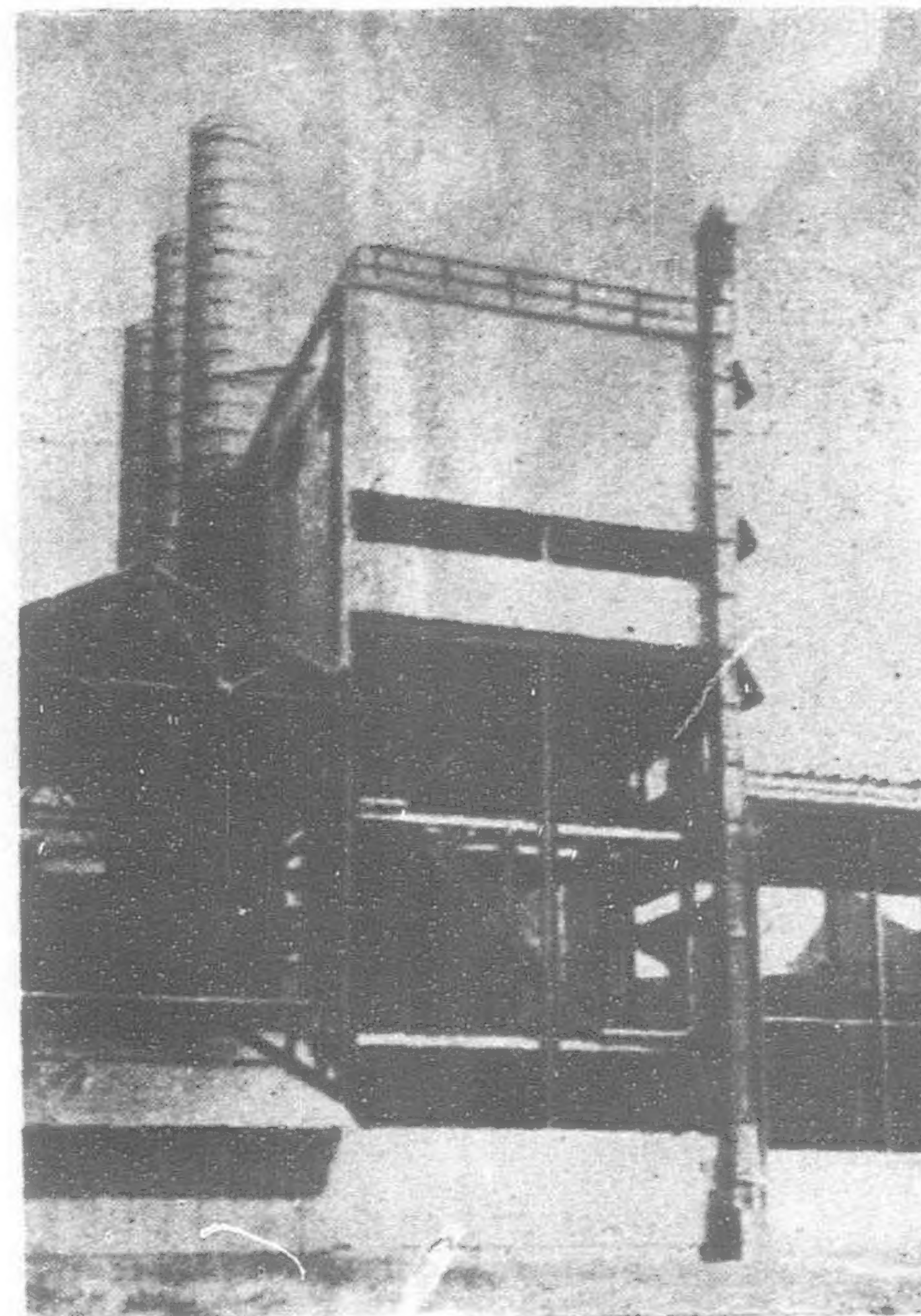


Fig. 10.—The Digester House

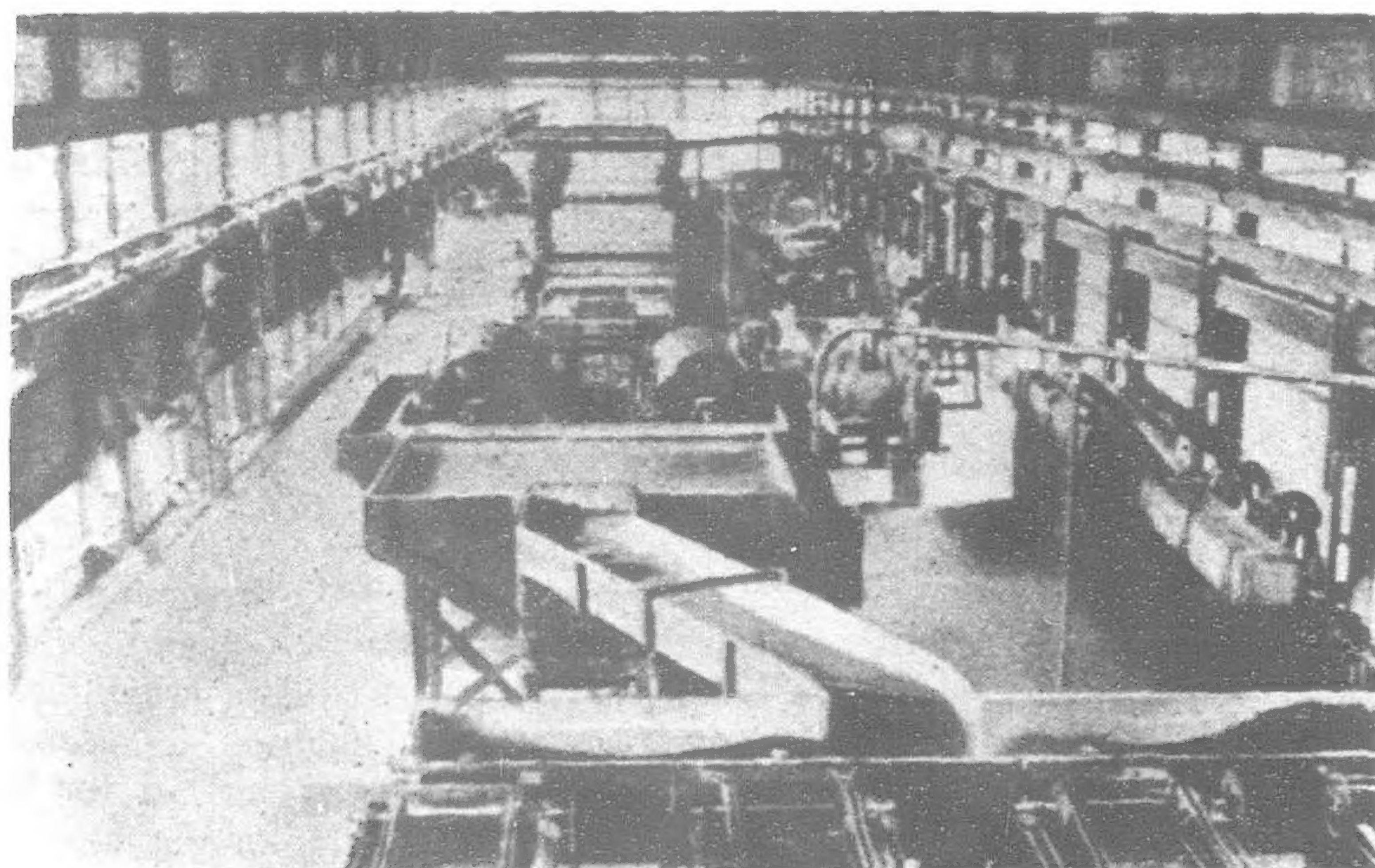


Fig. 11.—General view of the main mill room

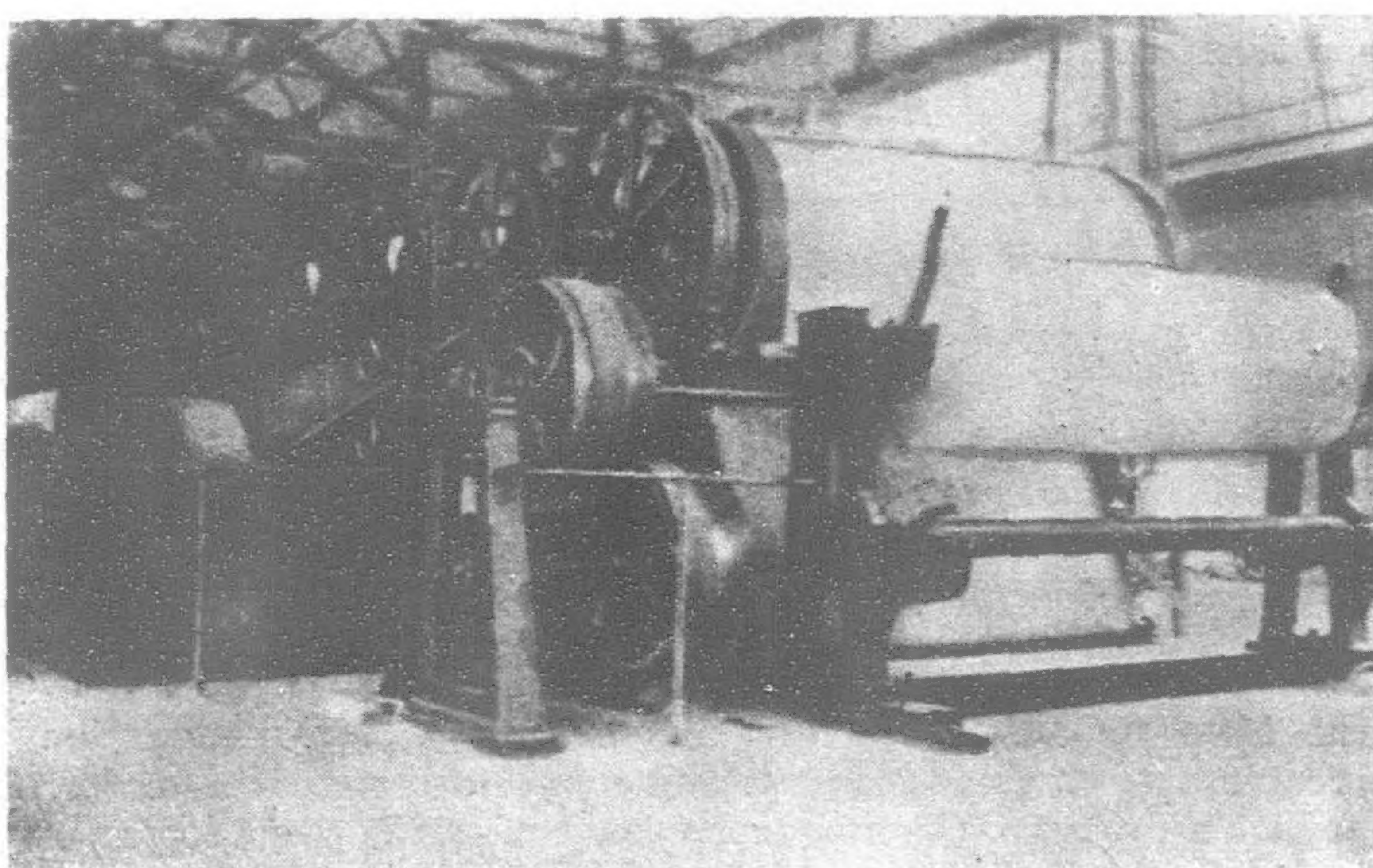


Fig. 13.—Delivery end of the paper pulp mill

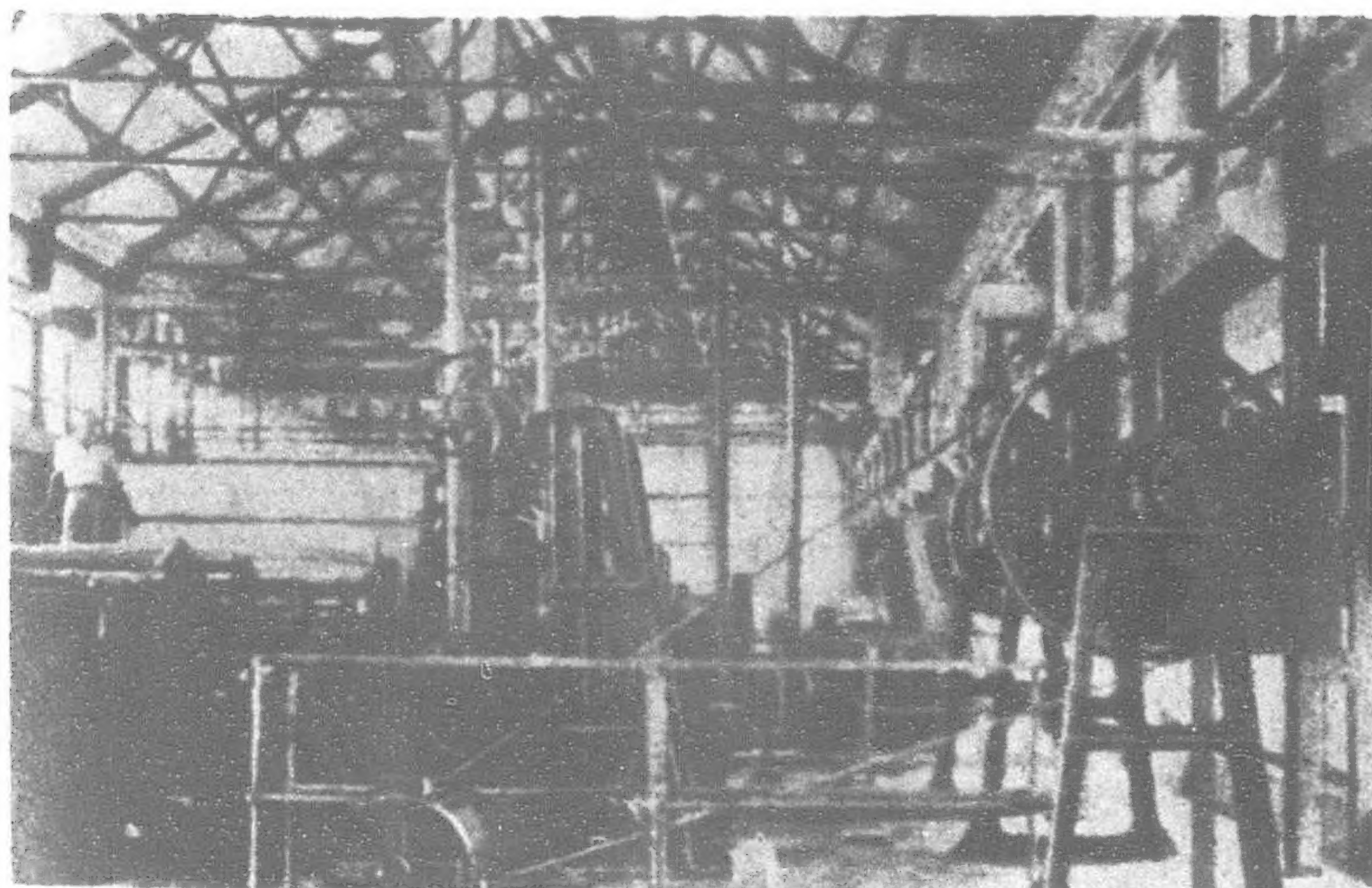


Fig. 12.—The feed end of the drying cylinders with the 60 h.p. slipring induction motor which drives the cylinders

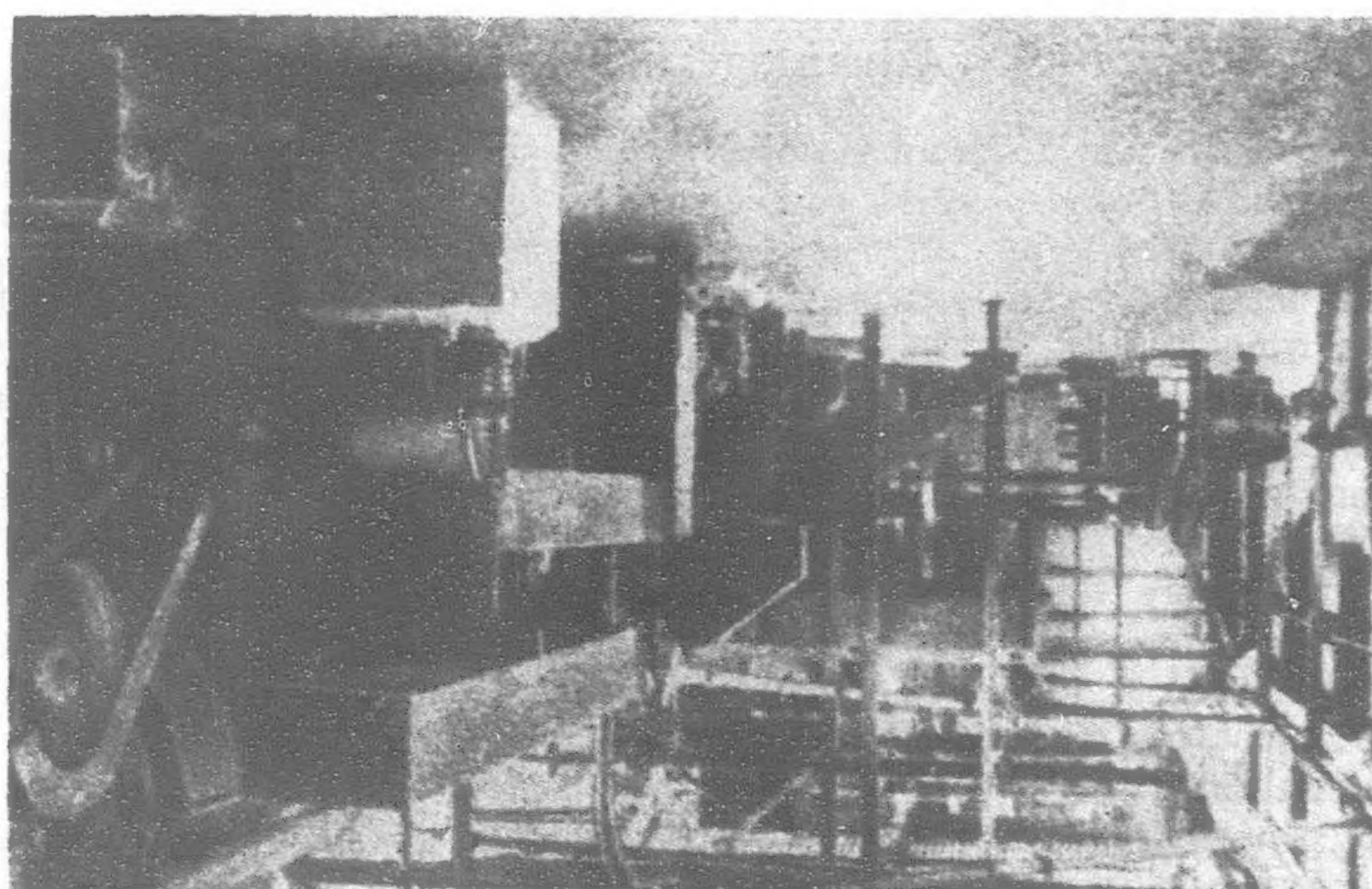


Fig. 14.—East end of the main mill room with electrically driven strainers



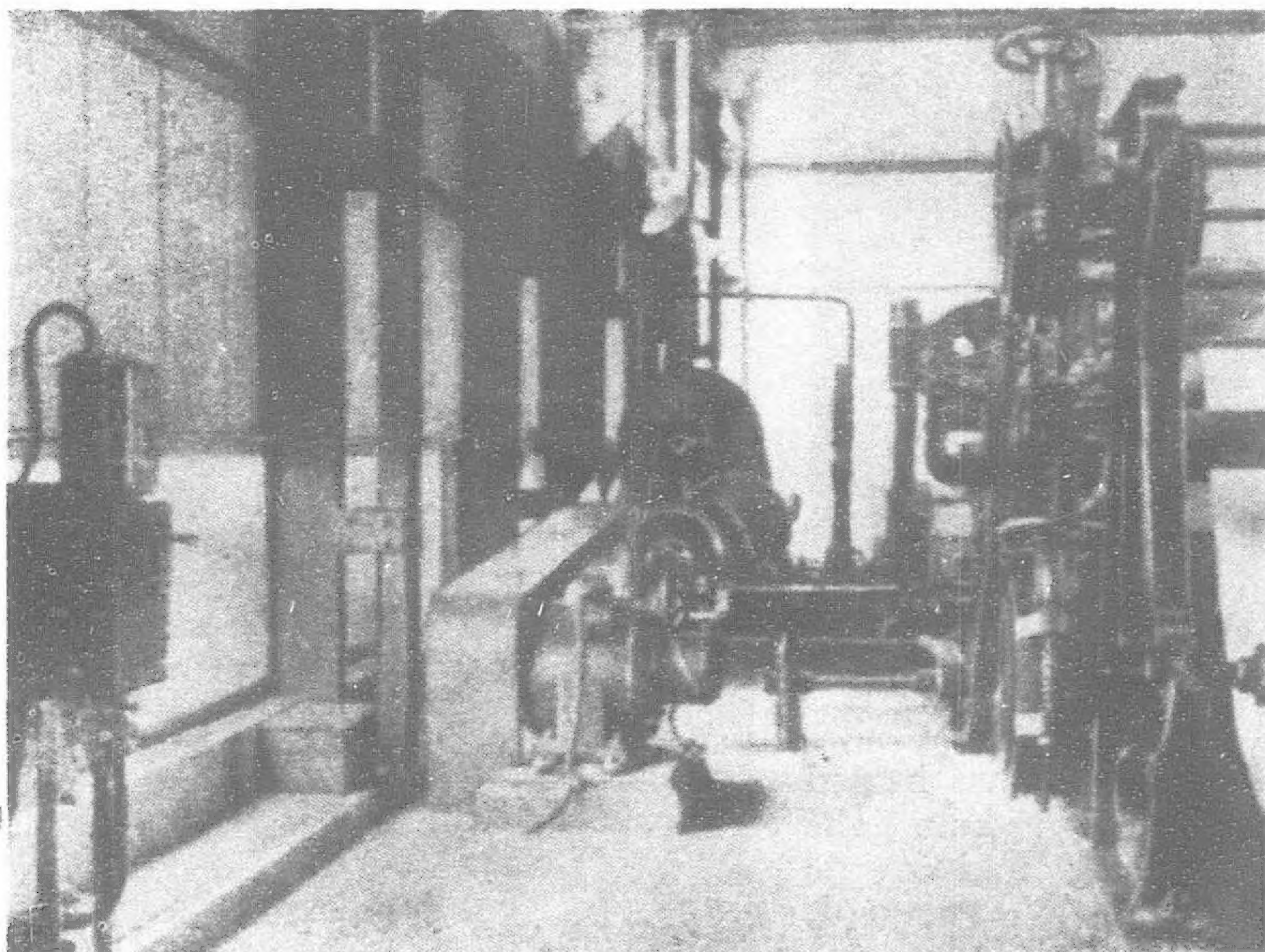


Fig. 15.—West end of the main mill room with 9 h.p. 1,140/380 r.p.m. slipring motor driving cutting machine

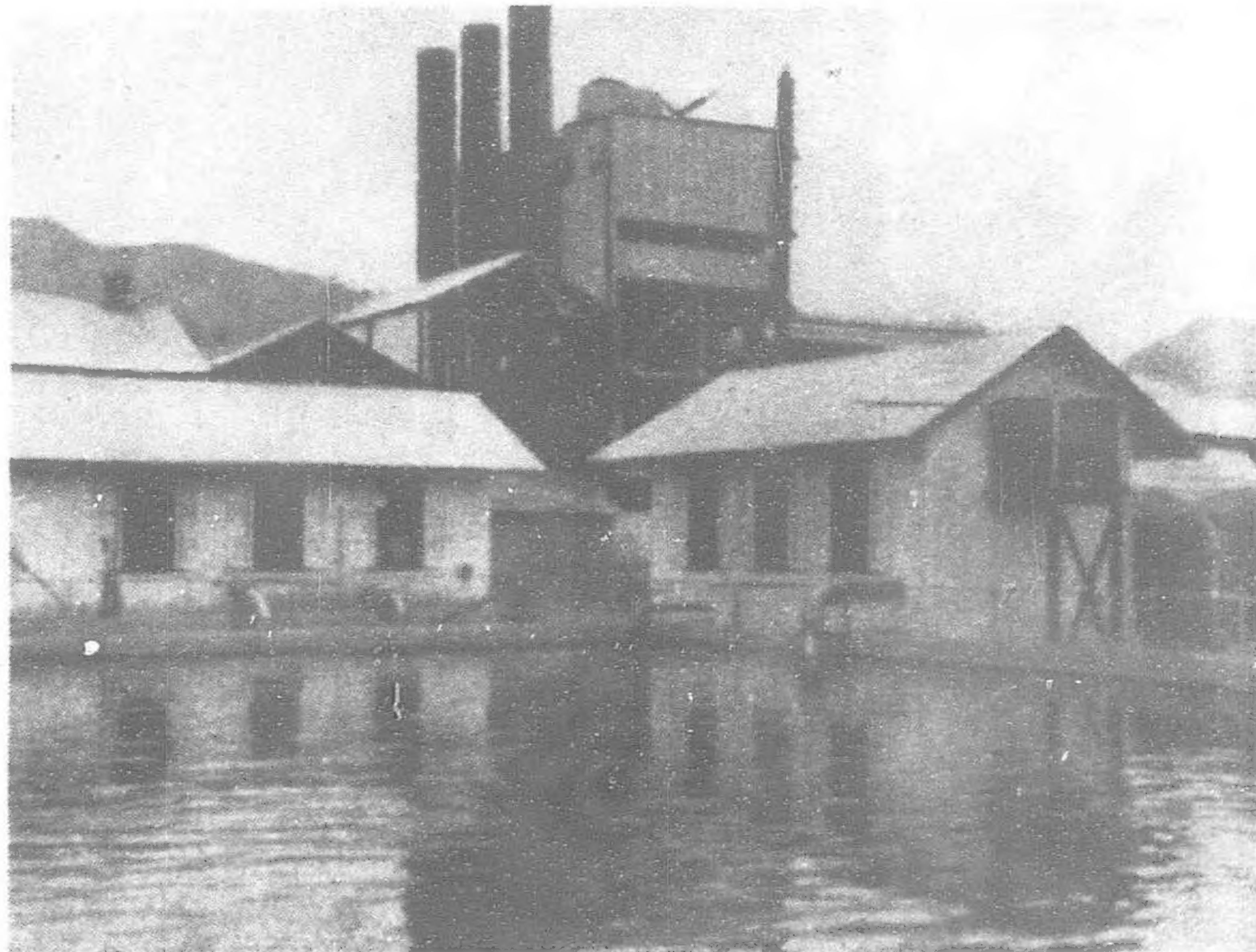


Fig. 16.—Water reservoir with pump house and water strainers

to the many other motors in the mill is unnecessary. They are of the protected or drip-proof type according to their situation in the mill. The control of the slipring motors is by oil immersed rotor panels, while the squirrel cage motors are controlled in some cases by star delta starters, and in others by direct to line starters.

### Main Pumping Equipment

The pump house on the San Juan river contains two main pumps, one of 30,000 and the other of 50,000 gallons per hour capacity. The slipring motors which drive them are rated respectively at 25 h.p. and 45 h.p. An auxiliary pump driven by a

double cylinder Diesel engine is also installed in the pump house.

The water is stored in a large concrete tank near the factory buildings, Fig. 16, and from there it is passed through filters into a smaller tank and delivered to the factory by means of electrically driven high and low pressure pumps. The factory is also equipped with a water softening plant.

The author is greatly indebted to G. D. Smooker, Esq., Managing Director of the Trinidad Paper Pulp Mill for permission to publish the foregoing information and illustrations, and also to Thos. Nelson & Sons, Ltd., and James Bertram & Son, Ltd., for technical and other information relating to the manufacture of the pulp and the operation of the plant.

## Progress of The Fast Diesel-Powered Railcar

(Continued from page 68)

automatic regulation. The supercharging group is connected to the Diesel engine through the currents of air and gas. It adapts itself automatically to any load; the more fuel is injected at rising load, the more exhaust gases are generated; the turbine delivers a greater output, is accelerated and supplies a larger volume of air at higher pressure. Consequently, each charging stage corresponds to a definite number of revolutions of the supercharging group, the latter so proving to be a very sensitive load-indicator.

### Advantages Illustrated

Maybach-Motorenbau early realized the advantages of the pressure surges method and the 12-cylinder engine was designed from the beginning for supercharging on the pressure surges method. Generally speaking, it may be said that a nine per cent increase in weight of the supercharged Maybach railcar Diesel engine results in a forty-seven per cent increase of the rated output in comparison with the non-supercharged engine. Also, the space required for engine accessories is not larger than for the non-supercharged engine. The exhaust plant of the supercharged Diesel engine can be designed much more simply than that of the non-supercharged engine, as noise damping is already effected in the exhaust gas turbine and consequently no special silencer is needed. It is sufficient if a simple exhaust gas pipe is led directly from the exhaust turbine into the open air.

As stated above, the heat developed in the supercharged 600/650 h.p. Maybach Diesel engine is not higher than that of the non-supercharged 410/450 h.p. engine. Therefore there is no need for

a larger cooling aggregate. It is to be seen from the foregoing that the weight of a complete engine plant with supercharged 600/650 h.p. Maybach Diesel engine is not heavier than that of a complete engine set with a non-supercharged 410/450 h.p. engine. The somewhat heavier weight of the Diesel engine is compensated for by the smaller weight resulting from the simpler exhaust plant.

The curve of fuel consumption shows that the supercharged engine yields quite favorable results with regard to consumption. The latter is lower and the curve of fuel consumption for fractional loads is much flatter than that of a non-supercharged engine. Therefore the supercharged engine affords the opportunity of building railcars with great engine power which can work profitably with fractional loads. The success attained with the supercharged Maybach Diesel railcar engine is widely recognized. In earlier articles details have been given regarding a number of supercharged engines delivered and under construction. According to details given in Messrs. Brown-Boveri's references the manufacturers of the supercharging groups on the Buchi method, the supercharged turbo-blowers for railway vehicles, supplied and on order, total 274,000 h.p. Up to the present Maybach-Motorenbau and their licensees have placed orders with Messrs. BBC and their licensees for supercharging groups for railway vehicles of about 133,000 h.p., that is, approximately 49 per cent of the total supply of BBC turbo-blowers for railway vehicles.

As most of the high speed Diesel engines for rail vehicles are equipped with the Buchi supercharging system the foregoing details illustrate the prominent position of the supercharged Maybach railcar Diesel engine.



# Exploitation of North China

**W**HILE warfare is still continuing in some parts of the country, conditions in North China have now become practically normal, and a great deal of economic and industrial activity is being conducted in a spirit of close collaboration between Japan and North China. The various activities which are taking place in that part of the country were outlined by Mr. Teiji Okubo, Director of the North China Development Company, in an overseas radio talk given recently. The following are some of the main points of Mr. Okubo's speech.

(1) Unification of railways. Since the development of railways is the key to the economic exploitation of North China, the first achievement in this connection, was the establishment, in April, 1938, of the North China Transportation Company as a Sino-Japanese joint undertaking to bring all railway lines in North China under unified management. Hitherto, the railways in that district, including the Peking-Shankai line, the Peking-Paotou line, the Peking-Hankow line and the Tatung-Puchow line, the Chengtai line, the Tientsin-Pukow line, the Shantung line and the Lunghai line, were all under different management, and some of them were financed with foreign capital and were under foreign direction.

Capitalized at ¥300,000,000, the North China Railway Company is the largest concern of the sort in that region. Although it is less than one year since its inauguration, the company has at present 85,000 employees, including 20,000 Japanese. With the volume of traffic increasing each month since its inception, some 1,500,000 passengers use the lines of the company every month, accounting for ¥10,000,000 per month in income. Considering the rich natural resources and the large population of some 100,000,000 in North China, it may be said with certainty that the company has a bright future ahead.

(2) Harbor project. The second major project in the development plans. Mr. Okubo continued, is the improvement of the

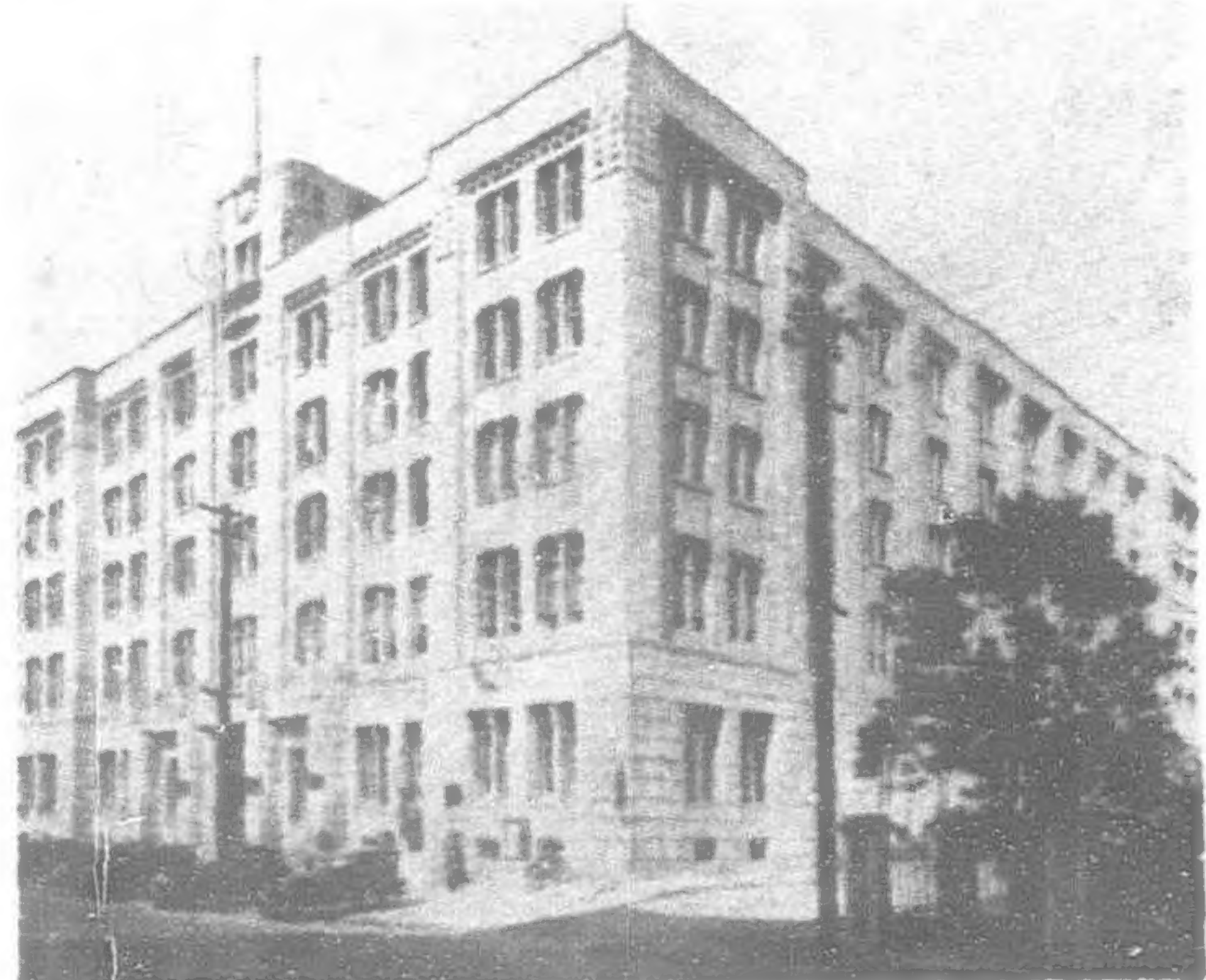
ports. Besides the ports of Tientsin and Tsingtao, the authorities are planning to open a port in Tangku, which it is intended shall become the largest in North China.

(3) Installation of telephone and telegraph system. The third basic project under development by this Development Company is the installation of the telephone and telegraph system. The North China Telephone and Telegraph Company was established in July, 1938, by joint Sino-Japanese investments, and at the end of May this year, there were 67 telegraph stations and 126 telephone offices under its direct management. During this short period since the Company's inception the total number of telegrams dispatched reached 243,000 and those received amounted to over 263,000, while telephone subscribers totalled 35,105.

(4) Development of power concerns. According to a survey made in October, 1938, from 30,000 to 40,000 kilowatts of electricity have been generated by the six power companies in North China. These companies own some 100 plants situated in various places. Though most of these generating plants use coal power, a number of hydro-electric plants will be built in Shansi and Inner Mongolia, where suitable sites are reported to have been surveyed. It is expected that these six electric power companies will shortly be merged.

(5) Exploitation of coal mines. North China is noted for its rich mineral resources, and particularly for its coal deposits, which are believed to be larger than in any other district in China. Although the development of these mineral resources has hitherto been neglected, owing to lack of capital and suitable technique, special emphasis will be placed on their exploitation in the future.

Mr. Okubo stated that with the Sino-Japanese investments, some seven coal mining companies are expected to be established shortly in North China. When these companies come into being, the coal production in North China is expected to increase at least five or six times.



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# Engineering Notes

## MINING

**APATITE IN KOREA.**—Apatite, an ore rarely found in Japan, has been discovered on Kaji Island, North Heian Province, in Korea, it was announced. A vein believed to contain more than 3,000,000 tons of the ore and extending several score of miles was discovered recently by Mr. Sadamu Yamaguchi, an engineer with the Geological Survey Bureau of the Government-General of Korea. Apatite, it was explained, was an ore used in the production of superphosphates. Because of its scarcity in Japan, imports from abroad are necessary.

**GOLD IN MALAYA.**—The possibility that new gold deposits may be found in Malaya near the Kelantan-Siamese frontier is mentioned by Sir Lewis Fermor in his report on the mining industry of Malaya which was published recently.

The principal gold deposits of Malaya occur at Raub in the rocks of the Raub series regarded as Carboniferous in age, he says.

The geological map shows that a long belt of such rock extends from Kelantan in the north through western Pahang and eastern Negri Sembilan to Malacca in the south.

**MINING ENTERPRISE.**—The mining of coal, gold and silver in 49 locations in the Yenki, Holung and Antu counties in eastern Manchuria has been decided upon by the Mitsui Mining Company.

The Mitsui Mining Company already completed the purchase of the mining districts, and a new mining company under the style of Mimuro Mining Company has been inaugurated with a capitalization of Y.300,000.

Jiro Ogata, the present managing director of the Mitsui Mining Company, has been appointed president of the new company. The head office of the newly established company has been opened at Lungching, Kirin province.

**GOLD IN FORMOSA.**—The Formosan Government-General's mining section has announced the discovery of another gold deposit, this time in the Dakusui ravines in Western Formosa, according to the Nichi Nichi. It has been reported from the Taichu-musha regions that 1.3 grams of gold was obtained from one-sixth of a cubic tsubo of earth and sand.

It is expected that more gold may be found in the upper reaches of the Dagusui ravines.

The officials in the Commerce and Industry Ministry's gold mining section were said to be calculating already the amount of gold which may be obtained from a full cubic tsubo of earth. (One tsubo is an area about six feet square.)

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Tokwa Boseki Kaisha, Ltd.

Toyoda Cotton Spinning & Weaving Co., Ltd.

Yu-Fong Cotton Spinning Co., Ltd.

**NEW MINING COMPANY.**—Another Japanese-sponsored company is shortly to be formed at Peking to be known as the Tatung Coal Mining Company Limited.

Established under the auspices of the Japanese-sponsored Mongol Federal Autonomous Government, the company will mine and sell coal from the Tatung district, in northern Shansi.

It will also co-operate with the well-known Lung Yen Iron Mines for the development of mining industries in North China.

The company, it is announced, will be capitalized at \$40,000,000 (Federal Reserve Bank currency).

## COMMUNICATIONS

**'PHONE TO EUROPE.**—Regarding the abrupt stoppage of the telephone service from Tokyo to Europe, except for Rome, Italy, due to the outbreak of the European war, the Communications Department, Tokyo, which has been engaged in negotiations with the Italian radio company to open a relay telephone service from Tokyo to Europe via Rome, signed an agreement with the Italian radio company to commence the service to Germany, Hungary, the Netherlands, Sweden and Switzerland.

**TELEVISION BROADCASTS.**—Television broadcasting will begin in Japan on February 11, Empire Day, the *Yomiuri Shimbun* reported.

The paper said that the Japan Broadcasting Corporation would start bi-weekly television broadcasts shortly afterwards. The Corporation, the paper added, had been making preparations to popularize television with the masses, but several obstacles stood in the way.

Empire Day will mark the opening of the celebration of the 2,600th anniversary of the founding of the Japanese Empire.

**PLAN 'PHONE CABLE.**—Shanghai may soon be linked by a telephone cable with Japan if the necessary appropriations, included in the Extraordinary Budget, by the Ministry of Communications are authorized.

A "loadless" cable, which would permit simultaneous telephone and telegraph communication, would be laid between Shanghai and Nagasaki. The Japanese Government now operates a telegraph cable between the two points.

The loadless cable, a Japanese engineering achievement, has met with success. It is being used for the trunk-line extending from Japan to North China through Korea and Manchoukuo. Atmospheric interference prevailing in wireless-telephone communication between here and Shanghai would be totally eliminated by the cable system, it was pointed out.

**RADIO 'PHONE NETWORK.**—Increases in radio-telephone circuits from Japan to various points of the globe are being sought by the Ministry of Communications.

Negotiations are underway to establish services with Turkey, Finland, Morocco, Iran, Egypt, and Peru, while a direct circuit to Brazil will be available in the spring, officials revealed.

As a precaution against possible interference with existing circuits by the European war, the Ministry will inaugurate on February 1, a service with Amsterdam by way of Bandoeng, in the Netherlands East Indies. Wireless telephone service to Palau in the Japanese Mandated South Seas Islands will also become available soon.

Ship-to-shore service, hitherto available with only two Japanese vessels, will be extended to include Italian ships operating between Genoa and Shanghai if negotiations between the Japanese and Italian Authorities are successful. These facilities may later be extended to foreign trans-Pacific ships equipped with radiophone apparatus.

## INDUSTRIAL

**BOOM IN EXPORTS.**—During the first nine months of 1939 Japan's exports of canned goods to European countries reached a total value of about £8,100,000—an increase of about £1,920,000 over the same period last year.

**ITALIAN MACHINERY.**—A contract for the purchase of Y.1,500,000 worth of Italian machinery was signed on January 31 by the Manchoukuo Government. The machinery will be purchased in accordance with terms of the Japan-Manchoukuo-Italian Commercial treaty.

Purchase of Italian products up until this time had been confined to automobiles, automobile parts and chemicals. It was expected, however, that Manchoukuo would in the future purchase other Italian-made goods.

**PLAN NEW CANAL.**—Cutting of a 27-kilometer waterway near Tokyo and reclaiming 5,700 acres of land at a cost of Y.30,000,000 will be started in April, the Ministry of Interior announces. The project will take 15 years to complete.

The canal will be built from the iron bridge at Torite in Ibaraki Prefecture to Funabashi in Chiba Prefecture and will drain the surplus water of the Tone River into Tokyo Bay. This was expected to prevent flood disasters in the Kanto district. The canal will be from 140 to 300 meters wide.

Reclamation work, using dirt removed to dig the canal, will be along the shore of Tokyo Bay from Funabashi to the city of Chiba. After this work is completed, 10,000-ton vessels will be able to berth along the shore.